TIME USE AND REPORTED PERCEPTIONS OF UNIVERSITY VOICE STUDENTS DURING SELF-GUIDED PRACTICE SESSIONS: A QUANTITATIVE CONTENT ANALYSIS

By

Alan J. Martin

B.Mus., Edinburgh Napier University, 2011

M.M., Central Washington University, 2014

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Dr. James F. Daugherty, Chairperson

_____
Dr. Jonathan Brumberg

_____
Dr. Melissa Grady

_____
Dr. William Matney

_____
Dr. John Stephens

Date Defended: June 5, 2017

The Dissertation Committee for Alan J. Martin
certifies that this is the approved version of the following dissertation:

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Chairperson, Dr. James F. Daugherty

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Abstract

Little research has appraised the behaviors of musicians in practice rooms during self-guided practice sessions, and no study to date has investigated singers' behaviors across multiple self-guided practice sessions. Therefore, the purpose of this study was to document by audio-recordings and questionnaires the audible behaviors and expressed attitudes of university vocalists (N = 40) across 5 self-guided practice sessions with attention to (a) duration of practice sessions compared to previously expressed estimations, (b) participants' attitudes and strategies with respect to vocal practicing, and (c) audible behaviors occurring during the first 15 minutes of practice. Among primary results: (a) Singers overall evidenced during the course of this study a mean practice session duration of 28 minutes; (b) There were significant differences in practice durations between male and female participants, and among some participants grouped according to reported years of voice lessons (<1-3 years and 6-9 years); (c) Mean estimations of participants' practice durations based on prior questionnaire data exceeded by 9 minutes actual mean practice time; (d) A majority (65%) of singers said they followed an established practice routine, including a significantly greater percentage of female than male participants and a significantly greater percentage of students reporting more than three years of prior voice lessons than those reporting fewer years; (e) Undergraduate students indicated to a significantly greater extent than graduate students they had received advice on how to practice from a studio voice teacher; (f) Participants, on average, said they practiced 5 days per week; (g) Analyses of the first 15 minutes of recorded lessons indicated that these voice students on average spent the largest percentage of time (43%) on singing of repertoire, and the second largest percentage of practice time (36%) on warm-ups and vocal technical exercises, with non-performance majors spending significantly more time on repertoire and less time on technique than voice performance majors; (h) To a significant degree, practice time devoted to technique generally increased and time

devoted to repertoire generally decreased as years of reported voice lessons (<1 – 9 years) increased; (i) Among participants overall, results indicated no significant difference between previously described modal first vocal practice behaviors (addressing warming up and technique) and actual first behaviors; (j) Of the 200 individual practice sessions examined, 141 (70.5%) began with singing behaviors not focused on repertoire. Results were discussed in terms of directions for future research, singing voice pedagogy, and limitations of the study.

Acknowledgements

Music was not my first career choice. I began singing in high school, amidst much of my own protestation, but I did not consider music a serious career option at the time. During my first stint at university as a budding computer scientist I continued to sing merely as a hobby – yet music would continue to positively impact my life. If I could tell myself back then that I would ultimately pursue a terminal degree in music, I might have wondered: "where did it all go wrong?" Now, I cannot imagine doing anything else.

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CHAPTER ONE

Introduction

Independent practice is a key element in achieving advanced performance skills on a musical instrument. Few would disagree that vocalists should devote time to practice. Yet, not many vocal pedagogy textbooks address how singers might best utilize their practice times. To date, moreover, no study documents how singing students actually spend their time across multiple, individual practice sessions.

Suggested Factors About Current University Students Relative to Use of Practice Time

Various factors may contribute to how current university music students use and structure their practice times. Barry and McArthur (1994), for instance, find that most respondents to a survey of applied voice teachers discuss the importance of practice and specific practice strategies with students. However, college voice teachers' recommended practice strategies differ from practice strategies recommended by pre-college voice teachers. This difference may result in a disconnect between college teachers' expectations for student practice and students' assumptions based on advice from pre-college teachers.

Admission to music degree programs often depends on an assessment of performance skill by means of an audition process. This process ordinarily does not investigate potential students' practice skills or habits. Thus an admissions panel might assume that successful candidates already know how to use their practice time wisely because they exhibit an advanced level of performance.

Crappell (2013) addresses the challenges of preparing "Generation Z" students, or students born in the 1990s, to practice musical instruments. Crappell claims that because these students, raised in the age of the internet, are accustomed to instant gratification provided by a

mouse click, they have shortened attention spans and greater proclivity to multi-task compared to other generations. Thus, tasks such as music practice, a task that requires disciplined, singular focus, may seem to them arduous and boring.

As a pianist, Crappell offers several strategies for piano teachers working with Generation Z students to help their students establish a practice routine. He suggests that teachers allow students to practice a little within the lesson itself so that the teacher may observe them practicing and offer constructive advice on how to improve practice efficiency or target specific inefficiencies. Another suggested strategy is for a teacher to assign graded "power" ratings to specific practice strategies to encourage students to aim for more useful practice strategies in order to improve their practice score. The teacher assigns a greater power rating to more challenging or more beneficial strategies and students collect points relative to the power rating upon completion of those tasks. This power rating gives incentive for students to employ selected practice strategies. Other suggestions include assigning very specific details for a practice session and quick study pieces.

Advice Resources: Music Practice Generally

Aside from advice offered by their individual studio teachers or mentors, contemporary university music students may avail themselves of two major groups of published resources that address the use and structure of practice time: resources that may pertain to music practice generally, including those from an instrumental music perspective, and resources addressed specifically to singing students. Both types of resources tend to cite little or no controlled research. Such resources, of course, cannot tailor advice to individual students. Nonetheless, they provide one lens by which to understand some aspects of what the profession may consider "best practice" recommendations with respect to the use and structure of individual rehearsal time.

Observing that “few students arrive at college with comprehensive technical preparation” (p. 95), Klickstein (2009) suggests approaching practice time in terms of five categories of focus: (a) new material, (b) developing material, (c) performance material, (d) technique, and (e) musicianship. The author discusses warm-ups separately from practice rather than as part of the overall session, but he advocates the implementation of warm-ups into a daily musical routine. Klickstein then suggests that students further compartmentalize the five categories he sets forth by explicitly planning specific activities within each category, thus making it more manageable. Within each planned activity, Klickstein advises students to focus on seven habits of excellence: ease, expressiveness, accuracy, rhythmic vitality, beautiful tone, focused attention, and positive attitude. In addition, he recommends audio recording lessons and organizing repertoire scores into sections within a binder.

Klickstein maintains that students should practice daily six days per week via short sessions throughout each day rather than one long, daily session. He warns that increasing the amount of practice too much too quickly can lead to injury.

Kageyama (2013) offers a list of eight “practice hacks” in an online blog that typically addresses matters of performance anxiety. Kageyama begins by stressing the importance of deliberate, mindful practice over mindless, repetitive activity that, he suggests, pervades much of musical practice. The author acknowledges accounts of famous instrumentalists who suggest practice times up to but not exceeding 3 or 4 hours daily. However, he emphasizes quality over quantity, and efficient time use over simple duration of time.

Kageyama recommends these practice strategies: (a) scheduling practice sessions at the most mentally productive time in the day, (b) keeping the instrument out of its case so one is mindful of it and need not waste time unpacking it, (c) ending practice sessions with a problem

to address at the beginning of the next session, (d) practicing in short-duration sprints, (e) turning off cell phones, (f) setting limits on practice time, (g) following an iterative practice model, and (h) adhering to a problem solving practice model.

According to Tsioulcas (2013), one does not need to be revolutionary when preparing for a structured activity such as individual practice. She lists ten factors to consider: (a) practicing somewhere quiet, (b) having supplies nearby (e.g. pencils), (c) implementing useful technology (e.g. audio recordings, metronome apps), (d) having a set practice goal, (e) mapping a practice session like a workout, (f) practicing in small segments over one lengthy session, (g) not always starting at the beginning of a section, (h) challenging oneself physically, (i) practicing away from the instrument, and (j) rewarding hard work.

Carter (2013) references preliminary research that indicates random or interleaved practice may be more effective than blocked practice with self-contained units of endeavor. She speculates this difference may be due to a contextual interference effect. That is, executing a plan of action once per practice leads to excellent performance during practice, while having to execute a plan of action multiple times leads to retention and replication outside of the practice context.

Suggestions from Vocal Pedagogy Textbooks

Several vocal pedagogy and teaching books refer specifically to practicing. However, the scope of these discussions varies widely.

Dayme and Vaughn (2008) recommend one 45-minute practice session each day, but also state that 10 minutes is better than no practice at all. They emphasize the importance of daily consistency as well as ongoing mental practice outside of practice sessions. In relation to practice sessions the authors recommend a checklist of steps for a singer to complete: (a) spend thirty

seconds to one minute focusing; (b) check one's posture; (c) make sure one is seeing peripherally and is fully aware and present during the entire session; (d) do two minutes of physical warm-up using stretching and exercises for connecting one's right and left brain; (e) do five minutes of vocal warm-up, including an easy song to sing as an exercise; (f) vary the remaining time between learning new music and rehearsing familiar songs; (g) encourage one's imagination to make the words of the songs take shape; and (h) never leave the studio without singing one song with full involvement with the message, as if the student is performing before an audience of thousands.

Chapman (2012) discusses the priorities in developing the young adult classical singer at a music college. The author describes the typical student entering an undergraduate vocal music program. She emphasizes that these students are often technically underdeveloped as the general trend is for singers to begin serious singing lessons after the voice reaches a stable condition post-puberty. She also says that students successfully admitted to music degree programs typically have the ability to work hard and to concentrate. This opinion reflects a contrasting viewpoint to others who consider these students to lack the necessary disciplinary skills when it comes to practicing. However, Chapman concedes that a common failure of teachers working with voice students at university is the neglect of technical, healthy vocal development, and the lack of reinforcement of this development through insufficient instruction about independent practice.

Schmidt (1994) discusses matters pertaining to speed and deliberateness in practice. She emphasizes the amount of required experimentation under teacher supervision and independently, as well as the length of time it takes to master basic skills. The author stresses the importance of concentration and frequent breaks in order to prevent distraction. She also

recommends several short, concentrated practice sessions in a day over more lengthy sessions. Schmidt states that beginners should be able to practice for 30 minutes without tiring and without losing concentration. She also specifies that practice should occur in a quiet place and in an efficient standing position. Schmidt lists four pieces of necessary equipment: two mirrors (one full-length, one hand), a pen-light, and a recording device.

An outline for a singer's practice session, proposed by DeYoung (1958), begins with light, callisthenic humming exercises to warm up the voice, followed by breath and articulation warm-ups and work on pure vowel sounds. Next, he suggests employing remedial or corrective technical exercises as suggested by the studio teacher. Following that is a section of exercises focused on flexibility. DeYoung then suggests to work on musicianship, followed by song preparation.

Alderson (1979) likens singing practice to the practice of athletes. He explains that singing involves using repetitive muscular coordination much in the same way most sports skills do. The goal for both persons is to maintain a level of autonomy over the fundamental skills so that muscle memory becomes more dominant. Alderson uses this comparison in his recommended practice scheduling by explaining that singers must practice daily in order to develop the muscular coordination required to sing well.

Ware (1998) offers no specific structure for practice, but instead focuses on the psychological elements of voice practice. The author describes the importance of goal-setting and motivation in coaching student musicians through their development. He mentions that goals need to be realistic and separated into short-term (within 1 year), medium-term (1-5 years), and long-term (5-10 years) categories. The motivational factors should coincide with these goals to

generate a strong intrinsic motivation to succeed. This goal-oriented strategy, suggests Ware, may also improve the student's self-efficacy and overall happiness when practicing.

Advice from Professional Singers

In the book *Great Singers on Great Singers* (Hines, 2006), several famous opera singers advocate technical exercises as part of their daily practice regimes. Martina Arroyo says, "I use all kinds of scales and arpeggios designed for the conditions – fast scales, octaves – everything. I use certain scales according to the opera I am learning or singing at the moment – scales designed according to the hard passages" (p. 32).

Fiorenza Cossotto recalls, "My teacher started me on scales…fifths and ninths…on all vowels. Then we used sustained notes, taken softly, then louder, and back to pianissimo. Except for some early Italian arias, I studied for two years on scales alone" (p. 72). She also states:

> When I study now, I take my example from the great concert pianists, who study hard passages from their repertoire, by the hour. The vocal cords are even harder to handle than the fingers. So I say, 'If the pianist has to study for hours in order to move two fingers, how much more zealously should I tackle difficult passages' (p. 72).

Overview of Best Practice Recommendations

On the whole, the various kinds of available, published suggestions about how best to use and structure practice times share some commonalities: (a) include warm-ups, technical exercises, and repertoire study in separate sections, (b) practice frequently, (c) prepare for practice (having a plan and appropriate materials), and (d) maintain focus while practicing. There appears to be some degree of variance with respect to how long individual practice sessions should be and inclusion of musicianship exercises.

Need for the Present Study

Whether and to what extent current university students of voice actually follow recommendations from the professional literature with respect to use and structure of practice times remains an under-investigated area of research. Similarly, whether current recommendations from the professional literature address student use and structure of practice time with sufficient depth and realism remains an open question. Some previous studies (e.g., Byo & Cassidy, 2008) document practice time use of music majors (N = 38), including some voice students, by student self-reports and researcher observations of a subset of participants (n = 9), all instrumentalists, completing a single practice session. Data from a study of sound level measurements acquired over time from university voice students' (N = 14) practice sessions (Martin, 2015) include some indication of duration of practice sessions (ranging from 10 minutes, 38 seconds to 1 hour, 45 minutes) as well as student self-reports of their practice scheduling, which indicate most participants squeeze in practice sessions between classes, meetings, meals, appointments, and part-time jobs.

To date, no study documents by quantitative analyses of audio recordings the durations and overall structures of multiple self-guided vocal practice sessions of students at multiple universities. Such snapshot data could interest voice teachers as they make recommendations to their students and voice students as they reflect upon their practice routines. Such data would also provide one baseline for future research. For in order ultimately to investigate what factors may characterize effective use of practice time it is first necessary to document what students currently do with respect to use and structure of practice times.

Purpose Statement and Research Questions

Therefore the purpose of this study was to document by audio-recordings and questionnaires the audible behaviors and expressed attitudes of university vocalists (N = 40) across 5 self-guided practice sessions with particular attention to (a) duration of practice sessions, (b) participants' reported behaviors, attitudes, and strategies with respect to vocal practicing, and (c) audible behaviors occurring during the first 15 minutes of practice.

The following research questions guided this investigation:

1. What are the durations of participants' full practice sessions across the five sessions examined for this study?
2. What do questionnaire data suggest about participants' self-perceived practice session behaviors and strategies?
3. What specific audible behaviors, as measured by quantitative content analysis procedures (Krippendorff, 2004), do participants exhibit during the first 15 minutes of their practice sessions?
4. What specific audible behaviors do participants exhibit first during their practice sessions?
5. Are there significant differences in recorded and selected questionnaire data according to participants' sex, year in school, major, and reported years of voice lessons taken?

CHAPTER TWO

Review of Literature

This chapter reviews empirical studies completed to date concerning: (a) retention following structured practice, (b) lesson satisfaction, (c) practice models and assessment, (d) self-regulation strategies and motivation during musical practice, (e) questionnaires assessing instrumentalist practice strategies, (f) goal-setting for learning assigned repertoire, (g) task-specific practice behavior observations, (h) self-guided practice behavior observations, (i) time spent practicing, and (j) analysis of practice recordings. Within each topic area, these studies will be disaggregated according to the primary population addressed (instrumentalists and singers) where applicable.

Retention Following Structured Practice

Allen and Duke (2013) investigated the potential overnight changes in the performance of a short piano melody as a result of different practice protocols before going to sleep. Non-pianists (N = 32 woodwind and string players) learned the short melody through limited time and repetitions (3 sets of 15 repetitions with a 2-second delay between repetitions), and followed instructions to play the excerpt as quickly as possible while maintaining accuracy. Participants then engaged in one of four pre-sleep practice protocol groups: (a) learning a second short piano melody, (b) learning a difficult, unfamiliar piece on their primary instrument, (c) practicing a familiar piece on their primary instrument, or (d) engaging in no music-related motor behavior. All participants returned the following day (approximately 12 hours later) to complete an assessment of their ability to play the target piano melody as quickly as they could while maintaining accuracy. The posttest followed the same method as the initial learning protocol. Results indicated a decrease in performance speed of the target melody the following day for all

groups. The researchers speculated that this overnight decrease in performance speed may be due to the restrictions in time and repetition placed upon the learning of the target melody.

Lesson Satisfaction

Rife, Shnek, Lauby, and Lapidus (2001) investigated factors related to satisfaction with children's private music lessons, and sought to develop a practical measure of lesson satisfaction from the child's perspective. Participants (N = 568) between 9 years and 12 years of age completed a 45-item questionnaire with Likert-type responses for each question. The questions explored what participants liked and did not like about their private music lessons and how they liked their lessons overall. Factor analysis results indicated that participants perceived enjoyment and practicing to be potentially important factors upon music lesson satisfaction, and that participants were satisfied with lessons overall.

Practice Models and Assessment

Researchers often review, test, and scrutinize models for effective practice and practice assessment. Dreyton (2013) developed a theoretical practice model through study of existing literature that may allow music students to be more effective and successful in evaluating the difficult areas in their assigned repertoire. The model also may assist students in selecting the most appropriate practice strategies to maximize student progress. The researcher employed a pretest-reflection-practice-posttest-reflection framework for his practice model and required a list of necessary materials (the score to be learned, extra copies of the score, a pencil, a colored pen, a metronome, and a recording device) as well as a procedure. In this framework, the student conducted all tests, evaluations, and reflections independently and the researcher gave step-by-step instruction as to how to carry out the method. The researcher then implemented his theoretical practice model into the purpose statements of the original literature to create new

hypotheses. This study did not employ the model in practice, but instead provided future researchers the potential to implement this model into future studies to test its effectiveness.

Frey-Monell (2011) developed a criterion referenced self-assessment model for applied voice students (N = 13) to use during their practice sessions. This model sought to empower students to create their own criteria for assessment and to apply their criteria to their work. Students created their 16 criteria with 6-point Likert-type responses through a needs-assessment questionnaire and a focus group. Results indicated that a majority of participants perceived the model to be helpful in their self-assessments when practicing, improved their time management, gave clarity to learning objectives and goals, and better prepared the students for their lessons.

Self-Regulation Strategies and Motivation During Musical Practice

Varela, Abrami, and Upitis (2016) conducted a review of literature covering self-regulation in music practice and achievement of musical goals. The researchers reviewed studies (N = 25) from 1999-2011. The review related specific music learning variables (musical attainment, amount of practice, persistence during practice, practice content, and practice efficiency) from a range of empirical studies to the model of self-regulation proposed by Zimmerman (2000). Results of this review suggested several key points: (a) a weak, positive relationship between self-regulatory behaviors and the combined music learning variables; (b) a weak, positive relationship between level of expertise and self-regulation; (c) some studies indicated significant, positive relationships between perceived efficiency and amount of practice time; (d) there existed a range of very weak-to-moderate, positive correlations between self-regulatory processes and the music learning variables; (e) self-satisfaction was the self-regulatory process with the weakest correlation while goal-setting and self-evaluation had the highest correlation; (f) self-regulation instruction was the most important factor in self-regulatory

processes, and exhibited the strongest relationship in the review; and (g) self-efficacy was the factor most frequently associated with each variable of interest.

McPherson and McCormick (1999) investigated motivational and self-regulated learning components in the musical practice of pianists (N = 190) from 9-18 years of age. Participants completed two questionnaire items immediately prior to a scheduled playing examination not associated with the study. The first questionnaire contained 17 items pertaining to self-regulation (cognitive strategy use, self-regulation of practice) and motivation (intrinsic value, anxiety/confidence) during instrumental music. Questionnaire responses employed a 7-point Likert-type scale. The second questionnaire contained 11 items related to the amount and frequency of practice, including specific practice activities. Questionnaire responses employed a 5-point Likert-type scale. Factor analysis results indicated a weak, positive relationship between the quantity of practice leading up to the exam and the level of technical work the participant reported practicing, as well as a weak, positive relationship between amount of practice and participants' level of anxiety. Results also suggested that participants who reported a greater amount of practice on (a) informal/creative activities, (b) technical work, and (c) repertoire, expressed more interest in learning their instruments and showed more signs of cognitive engagement in their practice than those participants who practiced less.

Kim (2008) completed a case study of self-regulated learning in practice sessions of college string majors (N = 4). Participants completed semi-structured practice diaries about their practice over a two week period in addition to preliminary and exit interviews with the researcher. Results suggested that all participants exhibited a range of efficient self-regulated practice behaviors and that practice sessions are more effective when students set proximal goals, use appropriate practice strategies, monitor themselves, and self-reflect upon their practice

sessions. However, results also indicated that the younger students had more trouble staying focused and managing their time during practice sessions than older students. Lastly, participants' responses suggested that the semi-structured practice diary enhanced the self-regulated learning in practice across all participants.

Dos Santos and Gerling (2011) studied the self-regulated behaviors of piano students (N = 15) preparing a short 16-measure piano excerpt. Participants initially studied the piano excerpt without the help of their teachers for a total of 16 weeks while engaging in four semi-structured interviews with the researchers pertaining to their practice habits. The students completed three recorded performances during the 16-week period. The researcher investigated four factors related to self-regulation in the learning process: method, time, behavior, and social/cultural factors, with each factor scored on a scale from 0-5 using a researcher-designed rubric. Results indicated that most students (72%) offered more explanations about practice structure than any other factor, followed by specific practice behaviors (16%) and social/cultural factors (12%). Each participant selected the recording they perceived as the best, and two referees judged the selected performance based on nine factors: notes, phrasing, articulation, tempo, timing, dynamics, texture, character, and global coherence. Results suggested that the four-factor analysis of self-regulation might be useful in evaluating the musical improvement and valued strategies in practice behaviors.

Carter and Grahn (2016) compared the effects of blocked and interleaved practice schedules on performance. In the context of this study, interleaved meant alternating between activities as opposed to constantly focusing on one activity for an extended duration. Clarinetists (N = 10) first sight-read two repertoire excerpts and two technical excerpts. Participants then practiced one repertoire selection and one technical excerpt in a blocked schedule practice

session (12 minutes per piece), then practiced a second repertoire excerpt and technical excerpt in an interleaved schedule (3 minutes per piece, alternating until a total duration of 12 minutes was reached on each piece). Following the practice sessions, the researchers recorded the participants sight-reading the four pieces immediately following the practice session and again one day later. Three professional clarinetists judged and rated the recordings. Results indicated that whenever ratings differed, the judges rated pieces practiced in the interleaved schedule higher than those in the blocked schedule, although results varied across judges. Participants completed a questionnaire post-recording with responses indicating they perceived that the interleaved practice schedule had positive effects on factors such as goal setting, focus, and mistake identification.

Mikza (2012) developed and tested the validity and reliability of a questionnaire instrument designed to allow the self-reporting of measures related to self-regulated practice behaviors for beginning and intermediate instrumentalists. Participants consisted of middle-school band students (N = 302). The questionnaire consisted of items pertaining to motive (n = 10), method (n = 14), behavior (n = 7), time management (n = 6), and social influences (n = 10). The researcher employed 5-point Likert-type scale options as possible responses to questions. The questionnaire also included items specific to practice habits where participants indicated the time and frequency of their practice sessions, goals for their practice, and average daily practice efficiency. Results indicated that a four-factor model (self-efficacy, method and behavior combined, time management, and social influences) would be a better fit for the data rather than the proposed five-factor model (motive, method, behavior, time management, and social influences). Reliability estimates for internal consistency and test-retest consistency of the four-factor model indicated good to excellent reliability. The researcher found significant,

positive correlations between the four subscales and various practice habit reports. Results suggested that all subscales were predictive of at least one practice habit item and average practice efficiency, while the method/behavior subscale was predictive of practice time.

Ritchie and Williamon (2013) examined the self-regulated learning and self-efficacy of undergraduate music students (N = 174). All participants completed the Musical Self-regulated Learning Questionnaire that consisted of 10 questions using a 7-point Likert-type scale for responses. A number of participants (n = 139) completed three additional questionnaires (self-efficacy for musical learning, self-efficacy for musical performing, and self-ratings of musical skills and attributes). Results of the questionnaires indicated significant, positive correlations between self-efficacy for musical learning and behaviors and self-ratings of musical skills and attributes, but did not indicate any significant correlations between self-efficacy and musical performance.

Heller, Bullerjahn, and von Georgi (2015) examined potential the relationships between personality traits, flow-experience, motivation, and practice behavior of amateur vocal students (N = 120). All singers were currently taking singing lessons, but had never done so at a University or as part of a qualification. Participants completed a series of online questionnaires (N = 5) pertaining to personality traits (n = 2), flow-experience (n = 1), motivation (n = 1), and practice time and strategies (n = 1). The researcher identified nine identifiable practice strategies for frequency analysis: mental practice, mere repetition, varying practice, from detail to total, multiphase practice, practice at a microscopic level, automated practice, Stanislavsky method, and practice with rotating attention. Primary results indicated that only 46.7% of participants used any of the nine practice strategies, with mere repetition ranging the most common of all those employed. Among other results were significant correlations between participants with

high extraversion scores and more flow-experience in practice sessions, as well as indications of a relationship between high neuroticism scores and lesser flow-experience.

Araújo (2016) explored self-regulated practice behaviors in advanced musicians (N = 212) through an online questionnaire. The researcher designed the 22-item questionnaire to identify self-regulation practices through behaviors linked to expert music performers, with each question answered using a 5-point Likert-type scale. Analysis of the questionnaire instrument resulted in three sub-categories of self-regulated behaviors: practice organization (ten items), personal resources (seven items), and external resources (four items). Results indicated a predominance of self-regulation through personal resources in the practice strategies employed by the advanced musicians participating in the study, and that self-regulation through external resources decreased with experience. In addition, results indicated a potential negative relationship between practice time and age, and positive relationships between practice time, practice organization, and self-regulation through external resources. These results suggested that younger musicians may rely on practicing for longer durations.

Questionnaires Assessing Instrumentalist Practice Strategies

Sloboda, Davidson, Howe, and Moore (1996) investigated the role of practice in the development of performing musicians (N = 257) between the ages of 8 and 18. The researchers interviewed participants about their performance achievement and performance history back to when they started playing their instruments. The researchers conducted interviews mostly in-person (75%) with the remaining over the phone (25%). Interview questions items inquired about performance achievement, average daily formal practice time on the participant's instrument during each year of learning, time spent on improvisation, time spent playing through previously learned pieces, and unstructured informal activities. A subset of participants (n = 94) also kept

practice diaries for a 42-week period that included data on practice time and a variety of practice types. Students documented duration of time spent each day practicing repertoire, technical exercises, other solo playing, group performance, individual lessons, and individual performance. Results indicated: (a) a strong, positive relationship between performance achievement and the amount of formal practice completed; (b) other weaker relationships between performance achievement and the amount of informal playing; and (c) participants who obtained higher levels of performance achievement exhibited more consistent practice patterns over time.

Harnischmacher (1997) surveyed child and adolescent woodwind players (N = 142) about their practice behaviors over the course of a week. The researcher used a questionnaire to inquire about practice methods, amount of practice, socio-demographic variables, self-concept of instrument playing abilities, goal orientation of practice, external action distraction, and action orientation. Questionnaire responses indicated that motivation-relevant aspects of practice situations influenced practice methods more so than experience. Responses also indicated that participants employed a variety of practice methods, however many repetitive or slow tasks were a product of habit over motivation or planning.

Kostka (2002) surveyed a group of college-level studio music teachers (n = 127) and a group of music majors (n = 134) about attitudes and expectations for practicing music. A ten-item questionnaire focused on four major areas of interest: (a) attitudes about specific musical skills, (b) expectations concerning use of practice time, (c) expectations for routines and strategies for practicing, and (d) attitudes toward practice in general. Results indicated that teachers expected more weekly practice time than students reported. Also, most teachers expected students to follow a practice routine, and nearly all teachers stated that they discussed

practice strategies with their students, yet more than half of the students indicated that they did not follow a routine, and 67% of students reported that their teachers did not discuss practice strategies in their studio lessons.

Nielsen (2004) investigated the learning and study strategies of first-year university music students (N = 130) and the potential relationships between musicians' self-efficacy beliefs and strategies employed. Participants completed a 50-item questionnaire designed to assess the use of learning and study strategies. The questionnaire included three categories of strategies: cognitive (rehearsal, elaboration, organization, and critical thinking), metacognitive (metacognitive self-regulation), and resource management (time and study environment, effort regulation, peer learning, and help-seeking). Participants responded to each question using a 7-point Likert-type scale. Responses indicated that students generally employed cognitive, metacognitive, and resource management strategies during their practice sessions. However, participants employed resource management strategies less frequently than cognitive and metacognitive strategies. Furthermore, students demonstrating greater levels of self-efficacy showed more frequent use of cognitive and metacognitive strategies compared to those students who lacked confidence in their abilities. There were also no significant differences between instrument groups.

Austin and Berg (2006) investigated the practice regulation and motivation of sixth-grade band and orchestra students (N = 224). Participants completed a 36-item practice inventory and two short narratives in their own words, one describing a typical practice session, and the other describing how they might approach practicing a difficult piece of music. The researcher organized and coded the responses to the first narrative into two action categories (what an observer might see and hear), and the second narrative into 23 practice activities to allow for

frequency analysis. The results of analysis of the practice inventory indicated that orchestra players reported significantly higher levels of practice motivation than band students despite no significant differences between self-reported practice frequency, duration, or regulation. Results of narrative analyses indicated that while some students engaged in a range of practice and regulatory strategies, others did not follow strategic practice routines, and that this area of responses was not consistent.

Clark (2008) surveyed high school string students (N = 101) for information about relationships between (a) their musical backgrounds and self-efficacy beliefs, (b) their self-efficacy scores and performance achievement, and (c) their self-described practice behaviors and thoughts of self-efficacy. The researcher employed three measurement tools: a 25-item questionnaire to collect demographic and self-efficacy data, scores from a regional competition exam, and videotaped behavioral observations during practice and interviews of string students (n = 16) from two high schools in the same district. The researcher separated the sixteen string students into two sub-groups by self-efficacy score: eight higher and eight lower. The 16 students observed further practiced in two 10-minute videotaped practice sessions with each session on a separate day. Their practice consisted of 5 minutes of scales and 5 minutes of an All-Region étude excerpt. The researcher conducted the interviews after the last practice session. Interviews consisted of 10 questions divided into two sections: practice techniques and concepts, and specifics about practicing and playing string instruments. Results indicated (a) a statistically significant, inverse relationship between competition ranking scores and summed measures of self-efficacy; (b) participants in the higher self-efficacy sub-group exhibited more advanced and more cognitive practice strategies during observations and interviews; and (c) the lower self-efficacy sub-group exhibited less advanced and dissimilar strategies.

Ramdass and Bembenutty (2012) examined the self-regulatory behaviors of twelfth-grade Indian-American students (N = 153) as they practiced with musical instruments at home. Participants answered a series of questions about their musical practice, and their teachers answered a subset of questions relating to the student's performance. Questions pertaining to help-seeking (n = 6), academic delay of gratification (n = 10), teacher assessment of music performance (n = 2), self-efficacy beliefs for learning music (n = 4), intrinsic motivation for learning music (n = 5), self-regulation of learning music (n = 10), time spent practicing music (n = 1), music anxiety (n = 3), and perceived responsibility for learning music (n = 18) included an answer scale, and the question about frequency of music practice required a short answer. Results indicated a weak, positive relationship between self-regulation and music practice, self-efficacy, and intrinsic motivation (among other factors), suggesting that self-regulation may be important in successful music practice.

Hallam et al. (2012) researched the development of practice strategies and motivation in young musicians (N = 3,325) as their experience increases. Participants completed a questionnaire soliciting their practice strategies, organization of practice, and motivation to practice. Respondents answered questions using a 7-point Likert-type rating scale. The researcher disaggregated responses into nine levels of participant experience and identified seven factors for analysis: adoption of systematic practice strategies, organization of practice, use of recordings for listening and feedback and use of metronome, use of analytic strategies, the adoption of ineffective strategies, concentration, and immediate correction of errors. Results indicated statistically significant linear relationships between grade level (experience) and four factors: adoption of systematic practice strategies, use of recordings, adoption of ineffective strategies, and immediate correction of errors. There were no significant relationships between

experience and organization of practice. Results also suggested that more experienced learners practiced more frequently and for longer durations than less experienced learners, but even the most experienced or advanced learners did not practice every day.

StGeorge, Holbrook, and Cantwell (2012) interviewed children and adults (N = 66) about practice strategies. The researchers investigated relationships between practice strategies and musical and technical outcomes, as well as participants' learning experiences in relation to continued participation in music. The researchers suggested that although participants utilized a variety of practice strategies, knowledge of strategies was insufficient, and that inadequate prior instruction on how to best employ and adapt these strategies in a practice setting may result in ineffective learning. Participants' responses indicated three learning patterns (constructive, expedient, and impetuous), each less efficient in self-regulation than the former. Responses also indicated that students with greater self-regulation in practice exhibited greater signs of self-efficacy.

Miksza and Tan (2015) surveyed wind instrument students (N = 241) and their studio teachers (N = 52) as to whether students' practice efficiency, flow, and self-efficacy for self-regulation varied according to (a) practice tendencies, (b) tendencies towards self-evaluation, (c) tendencies to be self-reflective when practicing, (d) tendencies to show grit in their learning, and (e) the teachers' methods of instruction in practicing. Studio teachers' responses were open-ended descriptions of how they would instruct a student to practice a specific étude. Students' responses consisted of 7-point Likert-type scaled questions pertaining to practice reflection (n = 10) and practice efficiency (n = 12). The authors also included researcher-adapted subsets of questions about self-efficacy (n = 13), grit (n = 8), and flow (n = 9) in the student questionnaire, all of which included 7-point or 5-point Likert-type scales for responses to each question. Results

indicated significant positive relationships between students' reported grit and tendency to self-reflect and the three outcome variables (practice efficiency, flow, and self-efficacy for self-regulation). Contrastingly there was no observed relationship between teachers' methods of instruction and the three outcome variables – however, analyses indicated that teachers' described approaches to practice were not reported by their students, suggesting a disconnect between the instruction of practice strategies in the studio and what is employed during individual practice.

Goal-Setting for Learning Assigned Repertoire

Rohwer and Polk (2006) investigated practice behaviors exhibited by eighth-grade instrumental students (N = 65) during 5-minute practice sessions. The researchers compared students' achievement based on their practice procedures and also explored a potential relationship between the number of practice strategies students could articulate and their performance improvement. Participants engaged in a practice session with the primary researcher present. At the beginning of the session, participants told the researcher as many strategies they typically used in their practice as they could recall before sight-reading a 24-measure excerpt. After sight-reading, the students practiced for 5 minutes with the aim of improving upon their sight-reading performance as much as possible, after which they performed the excerpt again. Four middle school band directors scored the initial and follow-up performances using an all-state woodwind & brass solo evaluation form. The assessors scored the performances in terms of melodic accuracy, rhythmic accuracy, tempo, interpretation, and articulation with each category rated on a 5-point scale. The researchers categorized the students by observed practice method: (a) holistic, non-corrective (did not stop for errors in their run-throughs); (b) holistic, corrective (stopped only for errors in their run-throughs); (c) analytic, reactive (stopped to remediate

sections of music); and (d) analytic, proactive (jumped around in the music to fix errors). Comparisons of performance improvement scores between these groups suggested that students who practiced analytically improved significantly more than those who practice holistically. Results also indicated a positive correlation between the number of verbalized practice techniques and performance improvement.

Leon-Guerrero (2008) examined the self-regulation strategies employed by adolescent student musicians (N = 16) during videotaped practice sessions. Participants were asked to 'think aloud' as they practiced a newly assigned piece for 12 minutes before playing the entire example at the end of the session. Immediately following the performance of the entire example, participants watched the video of their practice session with the researcher, and provided an audio-recorded verbal reflective report of the strategies he or she employed during practice. The researcher also asked the participants what they were thinking about as they practiced the selection. The author transcribed both the audio and video recordings for analysis. Results indicated that repetition was the most frequently used practice strategy in both the retrospective verbal report and the video transcripts.

Sikes (2013) examined the potential effects of university string players' (N = 40) specific practice strategies on performance. Participants first completed a questionnaire about their musical background, experience, practice habits, and strategies. The players then studied a previously-unseen short musical excerpt for 1 minute and played the excerpt a pre-test. The researcher scored the pre-test performance using the Farnum String Scale. Participants then engaged in one of four randomly assigned practice treatment groups for 10 minutes: (a) free practice, (b) playing slowly then gradually speeding up, (c) repeating small sections, and

(d) playing the excerpt multiple times. All string players then rested for 1 minute and played the excerpt again as a post-test, which was scored similarly to the pre-test. Results indicated that all participants significantly improved regardless of treatment group with no significant differences among strategies regarding pitch, rhythm, expression, or overall scores. The researcher speculated that the greater overall practice efficiency and effectiveness of these experienced participants could account for such a universal performance increase.

Miksza (2007) examined the relationships between observed practice behaviors, self-reported practice habits, and performance achievement among high school wind players (N = 60). Participants completed three 25-minute practice sessions across three consecutive days and six performances of a researcher-composed étude across the duration of the study (a pretest and posttest for each practice session). Participants then rated their practice efficiency after each practice session using a one-item questionnaire with a 10-point Likert-type scale. The researcher and two additional judges scored the six performances of the étude both objectively (Watkins-Farnum Performance Scale) and subjectively (Zdzinski's Performance Rating Scale Supplement). The researcher also analyzed recordings of the practice sessions for frequencies of the following behaviors: repeating a measure, repeating a section, whole-part-whole, chaining, repeating the étude, slowing, varying pitch, varying articulation, varying rhythm, non-étude-related playing, singing or whistling, use of metronome, and marking the score. Participants' self-reports of practice habits included data about length of average practice session, average number of practice sessions each week, average percentage of time spent on formal and informal practice, frequency of listening to recordings while practicing, frequency of recording themselves practicing, frequency of using a metronome while practicing, frequency of using an electronic tuner while practicing, and general belief about personal practice efficiency. Results

indicated that participants' performance achievement scores significantly increased, and that the most frequently observed behaviors were repeating a measure, repeating a section, and marking the score. Also, there was indication of a strong relationship between performance achievement and self-evaluations of practice efficiency at day one, less so on day two, and not at all on day three. Only weak, positive relationships existed between self-reported practice habits and observed practice behaviors.

Miksza (2011) examined potential relationships between observed practice behaviors of collegiate wind players (N = 55) during deliberate practice and performance achievement. The researcher also investigated relationships between observed practice behaviors, performance achievement, and individual differences in impulsivity and achievement goal motivation. Participants engaged in one 45-minute session following written instructions. The players began the session by sight-reading a short étude comprising of two contrasting technical exercises (16 measures of lyrical music at a slow tempo and 26 measures of technical music at a fast tempo) to the best of their ability as a pretest. Participants then practiced for 23 minutes using any practice method they deemed appropriate with the goal of improving their performance as much as possible. The researcher cataloged the frequency of specific practice strategies during the practice session. Following the practice period, players then played the étude again to the best of their abilities as a posttest. The researcher scored each performance using performance rating scales to evaluate performances based on accuracy of notes, rhythms, articulations, and/or dynamics for each beat of the étude. After the posttest, all participants completed a series of questionnaires to assess participants' goal orientations, impulsivity, and average duration and frequency of practice sessions.

Results indicated significant positive correlations between performance achievement and the following observed practice behaviors: repeating two or four measure sections, whole-part-whole, slowing, chaining, and use of metronome. In contrast, results also indicated significant negative correlations between performance achievement and the following observed practice behaviors: varying pitch, and singing, whistling, or buzzing. Furthermore, results suggested that performance achievement increased significantly from pretest to posttest, with less-impulsive participants having higher scores on both tests.

Task-Specific Practice Behavior Observations

Instrumentalists. Williamon and Valentine (2000) recorded the practice sessions of pianists (N = 22) asked to memorize an assigned excerpt. The researchers grouped participants into four groups based on playing skill, with an assigned excerpt appropriate to the group skill level. Participants practiced the excerpt at unrestricted durations and frequencies of his or her own choice while audio recording each session and making an audio recording or written record of any practice activity away from the piano. Players practiced with the goal of playing the piece from memory in a performance setting. At the conclusion of the rehearsal period, the researchers recorded and evaluated the performances of each player's excerpt as played from memory. Performances received a rating on a 12-point system with 12 being the best rating. Following the performances, the researchers interviewed the pianists about the practice and memorization process. Results indicated that the amount of time spent practicing increased as level of skill increased. However, data indicated no significance between quantity of practice and quality of performance. Therefore, the overall data suggested that practice duration had a greater impact on performance elements than practice frequency.

McPherson and Renwick (2001) conducted a longitudinal study over a 3-year period investigating six dimensions of self-regulation (playing only, moving, counting, thinking, singing, and fingering) in the musical practicing of children (N = 7) playing instruments. Participants began the study aged between 7 and 9 years, and regularly videotaped their practice over the 3-year period. Analysis of behaviors indicated that participants spent more of their observable time actively practicing their instrument, suggesting an improvement in efficient use of time. The mean time spent practicing repertoire throughout the study represented the vast majority of time spent practicing (upwards of 84%). Results of self-relation analysis indicated that participants in this study did not regularly exhibit the six dimensions of self-regulation considered to be present in expert practice, which was indication that the participants lacked the skills and knowledge of how to effectively practice, despite instruction of what to practice and willingness to do so.

Duke, Simmons, and Cash (2009) observed pianists (N = 17) practicing a difficult three-measure excerpt and noted their task behaviors. Participants practiced the excerpt until they felt they could play the excerpt accurately and at the prescribed tempo during a retention test the following day. The researchers ranked the pianists on the quality of their playing on the retention test. Results yielded no significant relationships between ranking and practice time, number of practice trials, or number of complete practice trials, therefore suggesting that other factors such as practice method may potentially influence retention ability more so than how long or how much a pianist practices.

Singers. Little research to date has investigated the observed practice behaviors of singers when practicing. Ginsborg (2002) observed the practice strategies of classical singers

(*N* = 13) of varied experience levels as they learned and memorized a new song. Participants engaged in six 15-minute audio-recorded practice sessions during which they learned and memorized their assigned song. The singers learned the piece over two weeks as though they would be performing it after that time and narrated their practice sessions as much as possible to provide the researcher with a running commentary. The researcher transcribed the audio recordings for analysis of modes of attempt (words only, music only, and words and music together), while also separating these modes into iterations from score reading versus memory. Results indicated that more experienced singers did not necessarily learn or memorize the excerpt any faster or more accurately than less experienced singers. Results also suggested that those participants who memorized more quickly began doing so at an earlier stage in their practicing than other singers and were more likely to count beats aloud as a strategy while learning the piece.

Self-Guided Practice Behavior Observations

Very little research has focused on free-practice behaviors during musicians' self-guided solo practice sessions. Geringer and Kostka (1984) observed university music students in practice rooms at random times during the day throughout a semester and categorized the observed behaviors. To avoid intrusion, observers used one-way glass panels on practice room doors to conduct observations (*N* = 2000). The researchers divided practice room behaviors into performance (solo music practice, ensemble music practice, technical exercise practice, conducting practice, other performance activity) and non-performance (reading, writing, looking at music scores, getting ready, other non-performance activity) behaviors. Observers recorded only one activity per practice room observation. Following the observations the researchers surveyed 100 randomly-selected university music students as to the estimated number of hours

spent practicing per week and the approximate percentage of practice time devoted to each of the ten observed practice room behavior categories. Results indicated that 72% of observations had students engaged in a performance activity, whereas student questionnaire results suggested that students estimated their engagement in performance activity to account for 86% of their total practice time.

Time Spent Practicing

Music students often misestimate or inaccurately recall their time spent practicing. Madsen (2004) investigated the difference between estimated practice time versus actual practice time of musicians (N = 78) after a 30 year period. Participants completed a two-part questionnaire pertaining to (a) their perceived weekly practice during the school semester and (b) changes over time in perceived effectiveness ratings assigned to past teachers as measured using a 7-point Likert-type scale. The researcher discarded the data from part (b) as it did not directly relate to the purpose of this study. The researcher compared data from part (a) of the questionnaire to a recalled estimate of time spent practicing from the same participants 30 years later. The follow-up questionnaire solicited participants' estimated practice time related to their highest degree of performance-related activity post-graduation. Results suggested that after a 30-year period, participants were not accurate in estimating the actual time spent practicing (23% of participants underestimated, 77% overestimated), although they indicated confidence in the accuracy of their recollection. Results also indicated no strong relationship between time spent practicing and the highest level of performance achievement after leaving university, although the majority of participants believed there was a strong relationship.

Analysis of Practice Recordings

Byo and Cassidy (2008) surveyed music education majors (N = 38) on self-reported practice techniques and observed a subset of participants (n = 9) as they practiced in practice rooms. The questionnaire included items about demographic information, time spent practicing, the use of time in practice, practice techniques, and attitudes toward practice. Participants recorded videos of themselves practicing in a typical practice session and submitted them to the researchers for observation. The researchers analyzed each practice session for performance and nonperformance behaviors then calculated the time spent engaged in each behavioral category. The researchers then compared these data to data collected through the survey. Results indicated that all survey participants' responses showed common practice techniques; however, the observational component of the study did not indicate any consistently optimal use of the techniques mentioned in the survey. The majority of participants indicated that better self-discipline would improve their practice efficiency.

Lacunae in the Research Literature Reviewed

Most studies here reviewed focused on structured practice whereby the researchers provided participants with a task to complete within an allocated amount of time. Many studies looked primarily at practicing by instrumental musicians and included comparatively small numbers of vocalists. No study to date has examined intentionally the self-guided practicing behaviors of singers exclusively over a continuous time period within a single practice session. No study to date has documented specifically the practice behaviors of singers across multiple practice sessions.

CHAPTER THREE

Method

The purpose of this study was to document by audio-recordings and questionnaires the audible behaviors and expressed attitudes of university vocalists (N = 40) across five self-guided practice sessions with particular attention to (a) duration of practice sessions, (b) participants' reported behaviors, attitudes, and strategies with respect to vocal practicing, and (c) audible behaviors occurring during the first 15 minutes of practice. This chapter describes the participants, procedures, equipment, and data analyses pertinent to this study.

Participants

Participants (N = 40) constituted a convenience sample of university voice students of varying ages, experience levels, voice types, levels of study, and degree emphasis as listed in Table 1 below.

Table 1

Participant Demographic Information

Participant	Age	Level of study	Degree emphases	Time studying voice (years, months)	Voice Type
1	22	Undergraduate	Vocal Performance	10 years	Soprano
2	21	Undergraduate	Vocal Performance	7 years	Mezzo-Soprano
3	20	Undergraduate	Music Therapy	4 years	Mezzo-Soprano
4	27	Graduate (Master's)	Vocal Performance	10 years	Soprano
5	20	Undergraduate	Music Therapy	6 years, 6 months	Tenor
6	30	Undergraduate	Music Education	12 years	Soprano
7	22	Undergraduate	Musical Theatre Performance	4 Years	Tenor
8	21	Undergraduate	Music Education	5 years	Mezzo-Soprano
9	27	Graduate (Doctorate)	Vocal Performance	13 Years	Mezzo-Soprano
10	26	Graduate (Master's)	Vocal Performance	9 years	Soprano
11	26	Graduate (Master's)	Vocal Performance	8 years	Tenor
12	23	Undergraduate	Vocal Performance	7 years	Soprano
13	35	Graduate (Master's)	Opera Performance	15 years	Baritone
14	20	Undergraduate	Music Therapy	3 years, 1 month	Mezzo-Soprano
15	20	Undergraduate	Vocal Performance	12 years	Soprano
16	28	Graduate (Doctorate)	Vocal Performance	9 years, 7 months	Mezzo-Soprano
17	23	Graduate (Master's)	Vocal Performance	9 years	Tenor
18	20	Undergraduate	Vocal Performance	11 years	Soprano
19	22	Undergraduate	Vocal Performance	6 years, 2 months	Tenor

Table 1, continued

20	21	Undergraduate	Music Education	8 months	Baritone
21	22	Undergraduate	Vocal Performance	11 years	Soprano
22	25	Graduate (Master's)	Vocal Performance	2 years, 6 months	Tenor
23	19	Undergraduate	Music Education	7 months	Tenor
24	31	Graduate (Master's)	Vocal Performance	13 years	Baritone
25	24	Graduate (Master's)	Vocal Performance	5 years, 6 months	Soprano
26	23	Graduate (Master's)	Opera Performance	4 years 9 months	Mezzo-Soprano
27	31	Graduate (Doctorate)	Vocal Performance and Musicology	12 years	Soprano
28	20	Undergraduate	Vocal Performance	2 years	Tenor
29	28	Graduate (Master's)	Vocal Performance	9 years, 8 months	Baritone
30	23	Undergraduate	Music Education	3 years	Baritone
31	23	Undergraduate	Vocal Performance	7 years	Soprano
32	32	Graduate (Doctorate)	Vocal Performance	14 years	Tenor
33	20	Undergraduate	Music, Communications, Bible Studies	1 year	Baritone
34	19	Undergraduate	Vocal Performance	1 year, 10 months	Baritone
35	26	Graduate (Master's)	Opera Performance	11 years	Soprano
36	22	Undergraduate	Psychology	10 months	Mezzo-Soprano
37	26	Graduate (Master's)	Vocal Performance	8 years, 6 months	Soprano
38	45	Graduate (Doctorate)	Vocal Performance	12 years	Soprano
39	19	Undergraduate	Music Education	2 years	Baritone
40	23	Undergraduate	Vocal Performance	5 years	Tenor

Participants included undergraduate (n = 22) and graduate (n = 18) vocal students, all of whom engaged in regular individual practice as an expectation of their degree program or enrollment in a voice studio. Twenty-two participants were female (n = 14 sopranos, n = 8 mezzo-sopranos) and 18 participants were male (n = 10 tenors, n = 8 baritones). Twenty-nine participants indicated a performance degree emphasis, ten participants indicated a non-performance music degree emphasis, and one participant indicated a non-music degree emphasis (Psychology). Participants ranged in age from 19 years to 45 years (M = 24.3 years, SD = 5.2 years) and ranged in experience studying voice from 7 months to 15 years (M = 7 years 1 month, SD = 4 years, 4 months). All singers attended universities and music conservatories in the United States and the United Kingdom, and all spoke English as their native language.

With Institutional Review Board (IRB) approval (Appendix A) participant recruitment and selection occurred through word-of-mouth, social media, and personal and professional connections with the researcher. Communication with participants throughout the recruitment process, selection process, and study-proper occurred through social media, e-mail, phone, or text message. Participants signed a consent form (Appendix B) that stated the general purpose of the study (to observe practice room activity and solicit participants' thoughts and attitudes towards practice) prior to data collection.

Procedures

Questionnaires. I devised two questionnaire instruments and distributed an initial draft of each questionnaire to five vocal education experts for pilot testing, readability, and clarity assurance. Each expert had at least ten years' experience in performing solo voice and at least five years' experience in teaching solo voice. I incorporated the experts' comments and suggestions into the final versions of the questionnaires.

***Initial questionnaire*.** The initial questionnaire (Appendix C) consisted of three sections. Section one solicited demographic information. Section two consisted of four open-ended questions in short-answer format about practice frequency and duration.

Section three consisted of ten questions related to practice attitudes and strategies Participants answered questions in section three using either a 7-point Likert-type response or responding to multiple choice options. Participants completed the questionnaire online one time via *Google Forms*.

***Session questionnaire*.** Participants rated how well they thought they used their time during each practice session using a 7-point Likert-type scale (i.e., 1 = *not well at all* to 7 = *extremely well*). Participants completed this session questionnaire (Appendix D) online using *Google Forms* within 6 hours after each individual practice session.

Practice venues. During the course of the study, participants had the freedom to practice in venues they had previously used for, with no requirement to practice in the same venue each time. The venue could be a university-designated practice room or rehearsal room, the participants' home, a community music rehearsal space, or any other venue deemed suitable for practice by the participant. I limited participants to using venues in which they had previously practiced to control for the possibly confounding variable of introducing an unfamiliar practice room environment.

Recordings. I instructed participants to audio-record each of their five practice sessions using a digital device of their convenience. This procedure also allowed me to broaden the pool of participants by including those not near the primary research site. The majority of participants used a personal smartphone or other portable multi-application device to audio record their sessions, while a small number used a portable digital audio recorder. All devices recorded audio

in .mp3, .aac, .m4a, or .wav format. I deemed lossy compression formats acceptable for this study because I conducted no acoustic analyses.

I instructed singers to start the recording the moment they entered the practice space and to stop the recording the moment they left the practice space. Participants had the freedom to practice any material that corresponded to their studio assignments and goals, and they could choose the length of each practice session. Participants uploaded all session recordings to a singer-specific shared Dropbox folder through a Dropbox account from which the researcher downloaded the audio files for trimming.

After determining full practice session durations from the length of the original audio files, I trimmed the files to include only the first 15 minutes of audio for subsequent analysis. I left intact audio files of less than 15 minutes' duration. The research decision to analyze the first 15 minutes of each recorded session stemmed from a desire to include a greater number of participants than previously included in research studies of singer practice behaviors and to assess participants' audible behaviors across five practice sessions, rather than a single session. Given those parameters, it was not feasible to listen to the entirety of all five recordings from each of 40 participants. Moreover, a 15-minute window permitted acquisition of useful data appropriate to the particular research questions posed for this study.

Recording analyses. I used *CowLog 3.0.2* open-source software application to analyze the trimmed audio recordings and codify behaviors. Following quantitative content analysis procedures (Krippendorff, 2004) it was necessary to determine if the categories used in my analyses were both exhaustive and mutually exclusive to organize, tabulate, and analyze all observed behaviors. The procedures involved refining categories through a pilot analysis. To this end I initially proposed eight behavioral categories: (a) silence, (b) singing voice [non-

repertoire], (c) singing voice [repertoire – complete], (d) singing voice [repertoire – segmented], (e) speaking voice [non-repertoire], (f) speaking voice [repertoire – complete], (g) speaking voice [repertoire – segmented], and (h) keyboard without voice. "Repertoire – complete" was defined as a complete run-through of the piece, and "repertoire – segmented" as an iteration of repertoire in sections, or stopping to correct mistakes in a run-through. The researcher and two colleagues then used these categories as they listened to and analyzed the first practice sessions of 15 participants.

Following this analysis, all three listeners indicated concerns that the initial eight categories were not, in fact, exhaustive or mutually exclusive. For example, they did not account for situations where participants employed breath activation exercises, worked on rhythm exercises, or used non-keyboard electronic practice aids (NKEPA) such as metronomes and audio playback devices. The researcher and two colleagues then jointly decided upon revising the original eight categories into the following ten exhaustive and mutually exclusive categories to codify and document participants' audible behaviors during the first 15 minutes of practice: (a) silence, (b) breath activation exercises, (c) speaking voice [non-repertoire], (d) speaking voice [repertoire], (e) singing voice [non-repertoire], (f) singing voice [repertoire], (g) rhythmic exercises [no text or keyboard, (h) keyboard only, (i) NKEPA [no voicing], and (j) NKEPA [voicing].

Although conceptually the NKEPA [voicing] category could overlap with any of the singing voice or speaking voice categories, we decided (a) that documenting the extent to which this sample of contemporary voice students used non-keyboard electronic practice aids would be of interest to the profession, and (b) that in the initial set of recorded lessons examined the use of such aids while simultaneously speaking or singing was rare. Therefore, with respect to

documenting use of NKEPAs I decided to err on the side of being exhaustive with minimal sacrifice of exclusivity.

After this process, the researcher and his colleagues agreed that because we encountered no audible data in the first practice sessions of 15 participants that did not fit within the ten revised categories, those categories were now both exhaustive and mutually exclusive. We also found it feasible to use ten keyboard hotkeys to tabulate and sort the audible data while listening to recorded practice sessions.

Thereafter, I completed coding of all remaining participant recordings. I simultaneously wrote down the very first audible behavior in order to compare with Initial Questionnaire item 3.9. I then invited two experts in vocal music education each to analyze independently 25 randomly-selected recordings (12.5% of all recordings), resulting in 50 recordings (25% of all recordings) analyzed independently by two persons. Some research on human reaction time to sound has suggested it takes 186.92±73.017 milliseconds to respond to audible stimuli (Gandhi, Gokhale, Mehta, & Shah, 2013). With that factor and inevitable small variations of decision-making time in mind, we allowed a 5-second margin of error for purposes of determining reliability. Obtained inter-rater reliability (agreements divided by agreements + disagreements) was .95.

Statistical analyses. To analyze data obtained from recordings and questionnaires, I employed non-parametric statistics (frequency, mean, standard deviation, mode, percentage, and chi-square), *t*-tests, and ANOVA. I analyzed the Likert-scale items by: (a) means, modes, and standard deviations; (b) *t*-tests, ANOVA, and chi-square; and (c) percentage of responses per category. I used a pre-determined alpha level of .05 for all statistical tests.

CHAPTER FOUR

Results

Results for research questions one through four are presented in order of research questions posed for this investigation. Results for research question five (henceforth RQ 5) are presented in seriatim as data are disaggregated within other research questions.

Research Question One: Practice Session Durations

The first research question asked about the durations of participants' recorded practice sessions across the five sessions examined for this study. Table 2 shows the full duration of each recorded practice session per participant as well as a mean duration across five sessions for each participant. All durations are displayed in h:mm:ss format.

Table 2

Practice Durations for All Participants (N = 40) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
1	0:21:38	0:18:57	0:19:57	0:51:28	0:27:53	0:27:59	0:13:35
2	0:47:25	0:31:42	0:21:27	0:34:11	0:37:12	0:34:23	0:09:23
3	0:19:36	0:17:32	0:15:25	0:18:31	0:22:37	0:18:44	0:02:40
4	0:19:02	0:50:33	0:52:59	0:15:57	0:19:29	0:31:36	0:18:29
5	0:31:07	0:35:41	0:39:04	0:36:58	0:34:14	0:35:25	0:02:59
6	1:08:30	0:57:18	0:25:40	0:22:30	1:14:28	0:49:41	0:24:12
7	0:10:03	0:11:01	0:15:05	0:15:00	0:11:08	0:12:27	0:02:24
8	0:17:40	0:21:26	0:24:48	0:24:12	0:16:16	0:20:52	0:03:49
9	0:51:59	0:38:29	0:30:01	0:45:52	0:36:33	0:40:35	0:08:31
10	0:28:45	0:20:20	0:18:32	0:17:33	0:34:43	0:23:59	0:07:27
11	0:23:53	0:28:03	0:16:53	0:31:58	0:33:15	0:26:48	0:06:39
12	0:22:34	0:37:26	0:34:14	0:48:18	0:23:16	0:33:10	0:10:43
13	0:05:54	0:17:49	0:13:35	0:16:07	0:13:00	0:13:17	0:04:34
14	0:45:35	0:42:12	0:28:57	0:33:10	0:34:14	0:36:50	0:06:51
15	0:42:00	0:20:03	0:44:28	0:41:30	0:35:03	0:36:37	0:09:53
16	0:39:01	0:46:36	1:09:44	0:48:10	0:09:41	0:42:38	0:21:41
17	0:30:25	0:16:04	0:23:37	0:17:15	0:18:02	0:21:05	0:05:58
18	0:44:23	0:50:36	1:07:44	0:40:50	0:53:19	0:51:22	0:10:24
19	0:35:15	0:19:55	0:36:01	0:17:37	0:30:41	0:27:54	0:08:37
20	0:27:04	0:27:04	0:28:37	0:45:14	0:22:05	0:30:01	0:08:51
21	0:22:28	0:21:56	0:17:12	0:35:27	0:34:58	0:26:24	0:08:18
22	0:19:52	0:21:52	0:27:52	0:16:48	0:28:58	0:23:04	0:05:13
23	0:45:42	0:40:05	0:47:57	0:42:13	0:30:30	0:41:17	0:06:45
24	0:35:37	0:30:21	0:31:35	0:32:44	0:27:02	0:31:28	0:03:09
25	0:49:13	0:18:10	0:29:59	0:28:37	0:44:00	0:34:00	0:12:31
26	0:26:23	0:26:49	0:27:18	0:25:11	0:29:16	0:26:59	0:01:30
27	0:05:17	0:04:48	0:04:48	0:03:56	0:06:30	0:05:04	0:00:56
28	0:29:55	0:19:23	0:27:19	0:29:23	0:22:47	0:25:45	0:04:32
29	1:18:42	0:42:04	0:39:46	0:47:07	0:37:50	0:49:06	0:16:55
30	0:15:25	0:15:17	0:15:23	0:15:48	0:15:24	0:15:27	0:00:12
31	0:39:06	0:18:09	0:15:27	0:28:14	0:35:08	0:27:13	0:10:19
32	0:20:22	0:21:34	0:21:57	0:19:51	0:21:46	0:21:06	0:00:56
33	0:16:35	0:16:24	0:17:00	0:20:53	0:17:29	0:17:40	0:01:51
34	0:35:51	0:29:24	0:21:12	0:26:59	0:17:21	0:26:09	0:07:12
35	0:25:39	0:17:50	0:29:29	0:21:25	0:17:52	0:22:27	0:05:05
36	0:19:10	0:16:38	0:22:44	0:16:54	0:18:24	0:18:46	0:02:27
37	0:36:14	0:26:17	0:29:18	0:51:17	0:27:15	0:34:04	0:10:23
38	0:25:04	0:20:12	0:37:12	0:22:48	0:19:52	0:25:02	0:07:08

Table 2, continued

39	0:16:15	0:16:25	0:14:47	0:11:50	0:17:19	0:15:19	0:02:09
40	1:10:01	0:17:17	0:17:27	0:15:17	0:16:31	0:27:19	0:23:53
					GRAND MEAN	0:28:14	0:13:39

As indicated in Table 2, grand mean practice time duration of all participants across five sessions was 0:28:14. Practice session durations, however, varied idiosyncratically between and among participants. Individual practice time durations ranged from 0:03:56 (Participant 27, Session Four) to 1:18:42 (Participant 29, Session 1). Mean practice times per participant ranged from 0:05:04 (Participant 27) to 0:51:22 (Participant 18). Using only complete minutes and ignoring seconds, the modal practice time duration across all participants was 17 minutes.

RQ 5 disaggregations: Practice session durations. Tables E1 – E11 (Appendix E) present practice time durations per each singer according to participants' sex, level of study, degree emphasis, and years of voice study.

Comparisons of duration data disaggregated according to participants' sex, level of study, and degree emphasis showed that on average: (a) females (*M* = 0:30:23, *SD* = 0:14:27) practiced longer than males (*M* = 0:25:35, *SD* = 0:12:10), (b) undergraduate students (*M* = 0:28:39, *SD* = 0:13:47) practiced longer than graduate students (*M* = 0:27:42, *SD* = 0:13:32), (c) voice performance majors (*M* = 0:28:35, *SD* = 0:13:36) practiced longer than non-performance majors (*M* = 0:27:17, *SD* = 0:13:50), and (d) participants with 6-9 years of voice lessons (*M* = 0:32:20, *SD* = 0:12:53) practiced the longest of all participants disaggregated by reported years of lessons, followed by participants with less than 1 year of lessons (*M* = 0:30:01, *SD* = 0:11:18), 10 or more years of lessons (*M* = 0:29:26, *SD* = 0:16:08), 3-5 years of voice lessons (*M* = 0:25:19, *SD* = 0:12:38), and 1-2 years of voice lessons (*M* = 0:20:34, *SD* = 0:06:03).

However, only two of these comparisons were statistically significant: (a) male vs female mean practice durations, $t(198) = 2.45$, $p < .05$ (two-tailed); and (b) reported years of voice lessons mean practice durations, $F(4,195) = 4.44$, $p < .05$. A Post Hoc Tukey HSD Multiple Comparisons test indicated significant variances ($p < .05$) between two pairings: (a) <1 Year and 1-2 Years, and (b) 1-2 Years and 6-9 Years. None of the other comparisons was statistically significant: (a) undergraduate vs graduate comparisons, $t(198) = 0.44$, $p = 0.65$ (two-tailed); and (b) vocal performance vs non-performance major comparisons, $t(198) = 0.57$, $p = 0.56$ (two-tailed).

Research Question Two: Self-Reported Behaviors and Strategies

The second research question addressed participants' self-perceived practice behaviors and strategies. These data, obtained primarily from questionnaires, are presented according to (a) comparisons of estimated and actual practice session durations, (b) practice routine and self-reported frequency of practice, (c) self-reported practice attitudes and strategies, and (d) self-estimated efficiency of time use during practice sessions.

Estimated and actual practice session durations. Prior to beginning the recorded portion of this study, participants responded to two questionnaire items relative to estimated practice session durations: (a) total time spent practicing voice per day, and (b) number of separate vocal practice sessions completed each day. From these data, I derived an estimated individual practice session duration according to the following formula:

$$\text{Estimated Individual Session Duration} = \frac{\text{Estimated Total Practice Duration Per Day}}{\text{Estimated Number of Practice Sessions Per Day}}$$

Some participants ($N = 25$, 67.5%) responded with ranges of duration and frequency rather than supplying singular estimates. In those cases, I used the lower limit of the ranges for

estimated total practice duration per day and the upper limit of the ranges for estimated number of practice sessions per day to calculate the estimated individual practice session duration. This procedure resulted in the most conservative duration estimate possible for these particular participants.

To compare these derived estimates of practice session duration to actual recorded mean duration across five sessions, I rounded both actual and estimated durations to the nearest whole minute. Table 14 shows the result of this process. Three participants (Participant 13, Participant 30, and Participant 31) did not provide estimations of practice duration and frequency, and therefore are not included in Table 3.

Table 3

Differences Between Estimated and Mean Practice Session Durations (N = 37 Participants)

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
1	0:45:00	1	0:45:00	0:26:00	-0:19:00
2	0:30:00	2	0:15:00	0:34:00	+0:19:00
3	1:00:00	1	1:00:00	0:19:00	-0:41:00
4	0:30:00	1	0:30:00	0:32:00	+0:02:00
5	0:30:00	1	0:30:00	0:35:00	+0:05:00
6	0:45:00	2	0:23:00	0:50:00	+0:27:00
7	1:00:00	2	0:30:00	0:12:00	-0:18:00
8	0:30:00	1	0:30:00	0:21:00	-0:09:00
9	1:00:00	2	0:30:00	0:41:00	+0:11:00
10	1:00:00	4	0:15:00	0:24:00	+0:09:00
11	0:30:00	1	0:30:00	0:27:00	-0:03:00
12	2:00:00	1	2:00:00	0:33:00	-1:27:00
14	1:00:00	1	1:00:00	0:37:00	-0:23:00
15	1:00:00	1	1:00:00	0:37:00	-0:23:00
16	1:00:00	3	0:20:00	0:43:00	+0:23:00
17	1:00:00	2	0:30:00	0:21:00	-0:09:00
18	1:00:00	1	1:00:00	0:51:00	-0:09:00
19	0:30:00	1	0:30:00	0:28:00	-0:02:00
20	0:15:00	2	0:08:00	0:30:00	+0:22:00
21	0:30:00	2	0:15:00	0:26:00	+0:11:00
22	1:00:00	2	0:30:00	0:23:00	-0:07:00
23	1:00:00	2	0:30:00	0:41:00	+0:11:00
24	1:00:00	2	0:30:00	0:31:00	+0:01:00
25	0:30:00	2	0:15:00	0:34:00	+0:19:00
26	1:00:00	2	0:30:00	0:27:00	-0:03:00
27	1:00:00	5	0:12:00	0:05:00	-0:07:00
28	0:30:00	2	0:15:00	0:26:00	+0:11:00
29	1:30:00	2	0:45:00	0:49:00	+0:04:00
32	1:00:00	2	0:30:00	0:21:00	-0:09:00
33	0:20:00	1	0:20:00	0:18:00	-0:02:00
34	1:00:00	1	1:00:00	0:26:00	-0:34:00
35	1:00:00	1	1:00:00	0:22:00	-0:38:00
36	1:00:00	1	1:00:00	0:19:00	-0:41:00
37	0:30:00	3	0:10:00	0:34:00	+0:24:00
38	2:00:00	1	2:00:00	0:25:00	-1:35:00

Table 3, continued

39	0:30:00	1	0:30:00	0:15:00	-0:15:00
40	1:00:00	1	1:00:00	0:27:00	-0:33:00
				MEAN	-0:09:00
				SD	0:27:00

Note. P = Participant

The negative mean difference in Table 3 between estimated practice time and mean actual practice time (-0:09:00) indicated that, on average, participants may not practice as long as they estimated. However, as indicated by the range of differences between estimated and actual durations (range: -1:35:00 [Participant 38] to +0:27:00 [Participant 6]) and the overall standard deviation (0:27:00), the individual participant differences between estimated and actual durations varied considerably. Twenty-two participants (59.4%) overestimated their practice time and those participants did so, on average, by 0:24:00. Fifteen participants (40.6%) underestimated their practice time and those participants did so, on average, by 0:13:00.

RQ 5 disaggregations: Estimated practice session durations. Tables F1 – F11 and Figure F1 (Appendix F) present differences between estimated practice session durations and mean practice session durations per each singer according to participants' sex, level of study, degree emphasis, and years of voice study. Comparisons of actual vs. estimated duration data disaggregated according to participants' sex, level of study, and degree emphasis showed that on average: (a) females (*M* = -0:12:00, *SD* = 0:34:00) overestimated practice duration more than males (*M* = -0:05:00, *SD* = 0:15:00), (b) undergraduate students (*M* = -0:13:00, *SD* = 0:27:00) overestimated practice duration more than graduate students (*M* = -0:04:00, *SD* = 0:28:00), (c) voice performance majors (*M* = -0:10:00, *SD* = 0:29:00) overestimated practice duration more than non-performance majors (*M* = -0:07:00, *SD* = 0:24:00), and (d) participants with 3-5 years of voice lessons, followed by participants with 10 or more years of lessons, most overestimated

practice duration, while participants with 6-9 years of voice lessons most accurately estimated practice duration. However, none of these comparisons was statistically significant: (a) male vs female, $t(35) = -0.80$, $p = 0.42$ (two-tailed); (b) undergraduate vs. graduate, $t(35) = -1.01$, $p = 0.31$ (two-tailed); (c) vocal performance vs. non-performance majors, $t(35) = -0.29$, $p = 0.76$ (two-tailed); and (d) reported years of voice lessons, $F(4,32) = 0.34$, $p = 0.84$.

Self-reported practice frequency and routine. Table 4 shows short-answer responses to questions regarding practice frequency and routine. For the purpose of analysis, I assigned an affirmative indicator "Y" and a positive numeric correlate "1" where participants' responses indicated that they had established a practice routine, and a negative indicator "N" and a null numeric correlate "0" where participants' responses indicated that they had not established a practice routine. I also adopted the upper limit of the estimated number of practice days per week wherever participants provided a range.

Table 4

All Participants' (N = 40) Estimated Practice Frequency and Routine

P	Practice Days per Week	Established Vocal Practice Routine Details (verbatim participant responses)	Routine (Y/N)	Routine (Numeric)
1	5	Lip trills, body awareness (stretching, movement, ect), vocalization, repertoire.	Y	1
2	5	not really	N	0
3	5	Not every day.	N	0
4	6	Warm up for 15-20, maybe 30min; practice repertoire for another 30min	Y	1
5	6	It definitely varies depending on time, however, I am trying to get on track for every day	N	0
6	5	7-10 minute warm up and exercises followed by strategic working of vocal repertoire in entirety, and then reviewing problem spots.	Y	1
7	7	I warm up, work on material and then cool down	Y	1
8	3	warm up, practice the bad stuff my voice teacher mentioned in my previous lessons, maybe sing through my songs	Y	1
9	5	No	N	0
10	4	Yes, descending fives, ascending fives for onset practice, nine scales, octaves register switch work, rep vowels only, rep add consonants	Y	1
11	4	My warm ups are routine, but practice of my music varies	Y	1
12	5	I follow my recordings from my lessons. 15-20 warm up and then repertoire practice.	Y	1

Table 4, continued

13	1	No.	N	0
14	6	Warm-Up always comes first, but after that it could be anything	Y	1
15	7	I warm up for about 10-15 minutes, followed by sight reading, then practising repertoire	Y	1
16	6	Yes: do set vocal warmups for 15-30 minutes – vary on how the voice feels each day; learn new music – length depends on amount of music to learn; rehearse current repertoire – for recitals focus on certain sets or songs different days of the week. Audition season alternate arias and other repertoire each day. Currently rehearse recits for current opera and mark through arias or study score once a day,	Y	1
17	6	No	N	0
18	6	Yes (-ish), in the largest time gap of my day! (Usually somewhere between 10am and 1pm)	Y	1
19	5	Warm up, run the piece I'll be working on, then focus on challenging sections	Y	1
20	5	Not really. Depending on how much time I have	N	0
21	6	Warmup, 49ocalizes, repertoire	Y	1
22	6	Yes: warm-up consisting of a set of exercises then work on repertoire; much of my practice is non-singing (speaking text, memorization, context, rhythm work, etc.)	Y	1

Table 4, continued

23	4	5-10 minute warm up and sight singing practice, the rest spent running through pieces	Y	1
24	4	Warm up, practice, finish	Y	1
25	6	Warm up, do two or three exercises, sing rep. Or if I'm in a hurry I skip the warm up and exercises.	Y	1
26	5	Yes. Warm up, pick song, hit trouble areas, sing through.	Y	1
27	5	No, I practice when I have time and find time; but, I aim for the answers to the questions listed above.	N	0
28	6	If I haven't sung much already that day, a warmup period of 5-10 minutes (lip trills, soft sounds, etc.) followed by working on repertoire. Sometimes I solely work on exercises for 15-20 minutes.	Y	1
29	6	No	N	0
30	7	I do not follow an established routine	N	0
31	4	No, I don't. I really need to work on being more consistent in practicing.	N	0
32	3	Ascending and descending portamento, Caruso scale, Concone	Y	1
33	4	Same form each week, with slight changes	Y	1
34	6	Not really, depends on what I feel like working on each day.	N	0
35	5	Usually gentle warming up, then technical exercises, then repertoire work.	Y	1

Table 4, continued

36	4	no, I do not	N	0
37	5	Generally, I will warm up my body and my voice in the first session, and possibly start to look at repertoire but only singing them on vowels or making them into vocalize exercises somehow. During subsequent practice sessions in the day, I will focus on specific repertoire depending on what pieces I need over the next few days/weeks. Mostly I am working on songs/excerpts of recitative and scenes that are required for classes coming up (and/or outside gigs) over the next week or so. This can often involve just trying to speak the text to learn how to pronounce all the words! There are some pieces (generally arias) that are long term goals, so I will look at those a few times a week to start getting them sung in.	Y	1
38	4	Memorization practice at morning time, Vocal Training and musical stuffs for evening time.	Y	1
39	6	Not really, I just work on what I think needs the most work.	N	0
40	3	Warm-ups and vocal technique then Repertoire	Y	1
Mean	5.025			0.65
SD	1.25			0.48

Note. P = Participant

Participants, on average, reported practicing about five days per week (M = 5.03, SD = 1.25). Twenty-six participants (65%) indicated they followed an established practice routine, whereas 14 (35%) indicated they did not do so. Participants who described their routines typically mentioned some kind of beginning warm-up and repertoire study.

RQ 5 disaggregations: Self-reported practice frequency and routine. Tables G1 – G13 (Appendix G) present differences between self-reports of practice frequencies and establishment of practice routine according to participants' sex, level of study, degree emphasis, and years of voice study.

With respect to practice frequency per week: (a) female students (M = 5.09, SD = 0.92) practiced slightly more frequently during the week than male students (M = 4.94, SD = 1.59), yet the difference was not statistically significant, $t(38) = 0.36$, $p = 0.71$ (two-tailed); (b) undergraduate students (M = 5.18, SD = 1.18) practiced slightly more frequently during the week than graduate students (M = 4.83, SD = 1.34), yet the difference was not statistically significant, $t(38) = 0.87$, $p = 0.38$ (two-tailed); and (c) vocal performance majors (M = 5.03, SD = 1.30) practiced slightly more frequently during the week than non-performance majors (M = 5.00, SD = 1.18), yet the difference was not statistically significant, $t(38) = 0.07$, $p = 0.93$ (two-tailed). A one-way ANOVA with independent samples yielded no significant differences between number of practice days per week according to participants' reported years of voice lessons (F (4,35) = 1.00, $p = 0.42$).

With respect to having established a practice route, there were significant response differences between: (a) male and female participants, χ^2 (1) = 6.31, $p < .05$; (b) voice performance and non-performance majors, χ^2 (1) = 15.01, $p < .05$; and (c) according to reported years of voice lessons, χ^2 (4) = 75.91, $p < .05$. There was no significant difference between responses of undergraduate and graduate students, χ^2 (1) = 3.74, $p = .051$.

Practice attitudes and strategies: Likert-type responses. Tables 5 – 6 show participants' responses to eight 7-point Likert-type items regarding practice attitudes and strategies. The Likert-type responses were as follows: 1 = "Never", 2 = "Seldom", 3 =

"Occasionally", 4 = "Half of the time" or "No comment", 5 = "Frequently", 6 = "Usually", and 7 = "Always." Thus greater values in the Likert-type responses indicated participants' greater perceived frequency of the event in question. Table 5 shows all participants' Likert-type responses to each item.

Table 5

All Participants' (N = 40) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
1	7	7	2	1	5	6	7	5	5.00	2.33
2	6	4	1	5	7	5	4	1	4.13	2.17
3	3	4	2	2	3	5	5	1	3.13	1.46
4	6	6	1	2	2	3	6	1	3.38	2.26
5	6	6	5	3	6	7	7	5	5.63	1.30
6	7	6	5	6	6	3	6	5	5.50	1.20
7	7	7	7	7	7	7	7	5	6.75	0.71
8	2	2	1	4	3	5	4	1	2.75	1.49
9	6	6	4	6	5	2	5	2	4.50	1.69
10	7	6	4	3	6	5	7	5	5.38	1.41
11	5	4	3	2	5	6	7	3	4.38	1.69
12	4	6	7	3	6	5	6	2	4.88	1.73
13	2	2	1	1	1	1	1	1	1.25	0.46
14	6	5	1	3	2	4	7	1	3.63	2.26
15	7	7	1	5	3	6	7	2	4.75	2.43
16	6	6	5	5	6	5	7	4	5.50	0.93
17	6	4	4	1	7	2	7	5	4.50	2.20
18	7	5	3	2	4	5	7	1	4.25	2.19
19	6	6	2	1	3	3	5	2	3.50	1.93
20	5	5	4	5	6	7	7	3	5.25	1.39
21	7	6	6	1	3	6	7	3	4.88	2.23
22	6	6	2	3	5	2	7	4	4.38	1.92
23	6	4	2	4	5	4	6	1	4.00	1.77
24	4	5	2	2	6	3	6	2	3.75	1.75
25	6	6	2	3	5	1	7	1	3.88	2.42
26	6	5	1	1	2	6	6	2	3.63	2.33
27	6	6	5	2	6	1	7	5	4.75	2.12
28	6	6	3	3	3	7	7	3	4.75	1.91
29	6	5	3	4	2	4	6	3	4.13	1.46
30	6	7	4	2	6	7	7	3	5.25	1.98
31	4	3	3	2	3	5	7	1	3.50	1.85
32	4	5	3	2	6	6	6	6	4.75	1.58
33	5	4	2	4	5	3	5	6	4.25	1.28
34	6	5	5	4	3	5	7	2	4.63	1.60
35	3	4	1	1	7	3	6	2	3.38	2.20
36	5	6	6	4	3	4	7	1	4.50	1.93
37	6	6	2	5	7	7	7	3	5.38	1.92
38	7	5	1	3	3	6	6	2	4.13	2.17
39	7	6	4	2	6	6	7	3	5.13	1.89
40	4	4	2	3	3	3	7	2	3.50	1.60

Table 5, continued

Mean	5.53	5.20	3.05	3.05	4.55	4.53	6.25	2.75
SD	1.38	1.24	1.77	1.58	1.75	1.83	1.21	1.60

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Table 6 displays percentages of all participants' responses to each item by Likert-type category. These data provide an alternative view of the response trends among participants, including the most commonly selected response per question.

Table 6

Percentages of All Participants' Likert-type Responses (Items 1 – 8) Regarding Practice Attitudes and Strategies

	Percentage of Responses							
Likert Response	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
7 "Always"	22.50	10.00	5.00	2.50	12.50	15.00	57.50	0.00
6 "Usually"	45.00	40.00	5.00	5.00	27.50	20.00	25.00	5.00
5 "Frequently"	10.00	22.50	12.50	12.50	17.50	22.50	10.00	17.50
4 "Half of the Time" or "No Comment"	12.50	20.00	15.00	15.00	2.50	10.00	5.00	5.00
3 "Occasionally"	5.00	2.50	15.00	22.50	27.50	17.50	0.00	20.00
2 "Seldom"	5.00	5.00	25.00	25.00	10.00	7.50	0.00	25.00
1 "Never"	0.00	0.00	22.50	17.50	2.50	7.50	2.50	27.50

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively

According to Likert-type responses in Table 5 and Table 6 by decreasing order of means, and by observing trends in most frequently selected responses for each Likert-type item, participants on average reported that they "usually" or "frequently": (a) listened to the advice of their voice teachers (Q7: $M = 6.25$, $SD = 1.21$, range: 1-7), (b) enjoyed practicing the majority of

the time (Q1: *M* = 5.53, *SD* = 1.38, range: 2-7), and (c) found it easy to focus while practicing most of the time (Q2: *M* = 5.20, *SD* = 1.24, range: 2-7). Participants on average stated that they "half of the time" to "frequently" (d) set targets to achieve during each session more than half of the time (Q5: *M* = 4.55, *SD* = 1.75, range: 1-7) and (e) heard advice on how to practice from their voice teachers more than half of the time (Q6: *M* = 4.53, *SD* = 1.83, range: 1-7). Only "occasionally" did participants think they (f) made a list of things to practice less than half of the time (Q4: *M* = 3.05, *SD* = 1.58, range: 1-7) and (g) recorded themselves practicing and listened to the recordings less than half of the time (Q3: *M* = 3.05, *SD* = 1.77, range: 1-7). Participants on the whole reported that they "occasionally" to "seldom" (h) look in textbook resources to aid them in their vocal practice infrequently (Q8: *M* = 2.75, *SD* = 1.60, range: 1-6).

RQ 5 disaggregations: Practice attitudes and strategies (Likert-type responses items 1-8). Tables H1 – H11 (Appendix H) present differences between Likert-type responses (items 1 – 8) pertaining to practice attitudes and strategies according to participants' sex, level of study, degree emphasis, and years of voice study. A series of two-tailed, two sample *t*-tests assuming equal variances on each question indicated no significant differences between the responses of females and males (Q1: $t(38) = 0.56$, $p = 0.57$; Q2: $t(38) = 0.65$, $p = 0.51$; Q3: $t(38) = -0.55$, $p = 0.58$; Q4: $t(38) = 0.37$, $p = 0.70$; Q5: $t(38) = -0.55$, $p = 0.58$; Q6: $t(38) = -0.26$, $p = 0.79$; Q7: $t(38) = 0.12$, $p = 0.89$; Q8: $t(38) = -1.95$, $p = 0.057$). Undergraduate participants reported (Q6) being instructed by their studio voice instructors on how to practice significantly more frequently than graduate students, $t(38) = 2.28$, $p < .05$; otherwise there were no significant differences according to level of study (Q1: $t(38) = 0.10$, $p = 0.91$; Q2: $t(38) = 0.15$, $p = 0.88$; Q3: $t(38) = 0.87$, $p = 0.38$; Q4: $t(38) = 1.61$, $p = 0.11$; Q5: $t(38) = -0.37$, $p = 0.70$; Q7: $t(38) = 0.38$, $p = 0.69$; Q8: $t(38) = -0.89$, $p = 0.37$).

There were no significant differences between the responses of vocal performance and non-performance majors (Q1: $t(38) = 0.70$, $p = 0.48$; Q2: $t(38) = 0.62$, $p = 0.53$; Q3: $t(38) = -0.48$, $p = 0.62$; Q4: $t(38) = -1.22$, $p = 0.22$; Q5: $t(38) = -0.18$, $p = 0.85$; Q6: $t(38) = -1.01$, $p = 0.31$; Q7: $t(38) = 0.21$, $p = 0.83$; Q8: $t(38) = 0.05$, $p = 0.95$). A series of one-way ANOVAs with independent samples yielded no significant differences according to reported years of voice study [Q1: $F(4,35) = 0.61$, $p = 0.65$; Q2: $F(4,35) = 0.56$, $p = 0.69$; Q3: $F(4,35) = 0.92$, $p = 0.46$; Q4: $F(4,35) = 0,76$, $p = 0.55$; Q5: $F(4,35) = 1.06$, $p = 0.39$; Q6: $F(4,35) = 0.61$, $p = 0.65$; Q7: $F(4,35) = 0.51$, $p = 0.72$; Q8: $F(4,35) = 1.42$, $p = 0.24$].

Practice attitudes and strategies: Preferred start of practice behaviors and initial ways to learn new repertoire responses (multiple choice). Table 7 presents participants' responses to two multiple choice questionnaire items pertaining to practice attitudes and strategies, specifically preferences for start of practice attitudes and initial ways to learn new repertoire.

Table 7

All Participants' (N = 40) Multiple Choice Responses Regarding Start of Practice Attitudes and Initial Ways to Learn New Repertoire

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
1	Non-vocal warm-up exercise	Playing the vocal part on piano
2	Vocal warm-up exercise	Listening to a recording of the piece
3	Vocal warm-up exercise	Playing the vocal part on piano
4	Vocal warm-up exercise	Listening to a recording of the piece
5	Technical exercises or scales	Listening to a recording of the piece
6	Vocal warm-up exercise	Listening to a recording of the piece
7	Vocal warm-up exercise	Listening to a recording of the piece
8	Vocal warm-up exercise	Listening to a recording of the piece
9	Technical exercises or scales	Playing the vocal part on piano
10	Technical exercises or scales	Speaking the text
11	Vocal warm-up exercise	Listening to a recording of the piece
12	Vocal warm-up exercise	Listening to a recording of the piece
13	Non-vocal warm-up exercise	Listening to a recording of the piece
14	Vocal warm-up exercise	Playing the vocal part on piano
15	Vocal warm-up exercise	Listening to a recording of the piece
16	Vocal warm-up exercise	Speaking the text
17	Vocal warm-up exercise	Playing the vocal part on piano
18	Vocal warm-up exercise	Listening to a recording of the piece
19	Technical exercises or scales	Playing the vocal part on piano

Table 7, continued

20	Vocal warm-up exercise	Playing the vocal part on piano
21	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
22	Technical exercises or scales	Working things out just by looking at the music and not singing or playing
23	Vocal warm-up exercise	Listening to a recording of the piece
24	Vocal warm-up exercise	Speaking the text
25	Vocal warm-up exercise	Breaking piece down into smaller chunks and learning those one at a time.
26	Vocal warm-up exercise	Speaking the text
27	Technical exercises or scales	Practicing small sections of the piece that look more difficult than the majority of the piece
28	Vocal warm-up exercise	Listening to a recording of the piece
29	Vocal warm-up exercise	Singing the piece from beginning to end without stopping
30	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
31	Non-vocal warm-up exercise	Listening to a recording of the piece
32	Vocal warm-up exercise	Writing IPA/Translations of text on a score and learning the text first
33	Vocal warm-up exercise	Listening to a recording of the piece
34	Vocal warm-up exercise	Playing the vocal part on piano
35	Vocal warm-up exercise	Playing the vocal part on piano
36	Vocal warm-up exercise	Listening to a recording of the piece
37	Non-vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
38	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
39	Vocal warm-up exercise	Listening to a recording of the piece
40	Vocal warm-up exercise	Listening to a recording of the piece
Mode	Vocal warm-up exercise	Listening to a recording of the piece

Note. P = Participant

Obtained responses about the first activity during practice were, in descending order of frequency: “Vocal warm-up exercise” (*n* = 30 [75%]), “Technical exercises and scales” (*n* = 6 [15%]), and “Non-vocal warm-up exercise” (*n* = 4 [10%]).

Participant responses with respect to preferred ways of learning new repertoire were, in descending order of frequency: “Listening to a recording of the piece” (*n* = 18 [45%]), “Playing the vocal part on piano” (*n* = 9 [22.5%]), “Working things out just by looking at the music and not singing or playing” (*n* = 5 [12.5%]), “Speaking the text” (*n* = 4 [10%]), “Breaking piece down into smaller chunks and learning those one at a time” (*n* = 1 [2.5%]), “Practicing small sections of the piece that look more difficult than the majority of the piece” (*n* = 1 [2.5%]), “Writing IPA/Translations of text on a score and learning the text first” (*n* = 1 [2.5%]), and “Singing the piece from beginning to end without stopping” (*n* = 1 [2.5%]).

RQ 5 disaggregations: Practice attitudes and strategies (multiple choice). Tables I1 – I11 (Appendix I) present differences between multiple choice responses pertaining to practice attitudes and strategies according to participants’ sex, level of study, degree emphasis, and years of voice study. A majority of participants in all disaggregated groups stated a preference for beginning their practice sessions with a vocal warm-up exercise, and said they typically preferred to begin their study of new repertoire by listening to recordings.

With respect to preferring to start practice sessions with a vocal warm-up exercise, there were significant response differences (a) between undergraduate and graduate participants, χ^2 (2) = 7.2, $p < .05$; (b) between voice performance and non-performance majors, χ^2 (2) = 20.27, $p < .05$; and (c) according to reported years of voice lessons, χ^2 (8) = 117.75, $p < .05$. However, there was not a significant difference in response distribution of male and female participants, χ^2 (2) = 3.92, $p = 0.14$.

With respect to the preference to begin study of new repertoire by listening to recordings, there was a significant response difference between (a) undergraduate and graduate participants, χ^2 (1) = 52.8, $p < .05$; and (b) according to reported years of voice lessons, χ^2 (4) = 15.11, $p < .05$. However, differences between males and females, χ^2 (1) = 1.34, $p = 0.24$, and between voice performance majors and non-performance majors, χ^2 (1) = 0.78, $p = 0.37$, were not significant.

Session questionnaire: Likert-type responses. Shortly after completing each recorded practice session, participants responded to one 7-point Likert-type questionnaire item relative to estimated efficiency of time use during the practice session. Participants responded with one of the following options: "1. Extremely efficiently," "2. Very efficiently," "3. Somewhat efficiently," "4. Neither efficiently nor inefficiently," "5. Somewhat inefficiently," "6. Very inefficiently," or "7. Extremely inefficiently." Table 8 shows all participant responses for each of five practice sessions.

Table 8

All Participant's (N = 40) Practice Session Self-Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
1	3	2	3	2	3	2.6	0.55
2	2	2	3	3	2	2.4	0.55
3	3	3	2	3	2	2.6	0.55
4	1	3	2	1	2	1.8	0.84
5	2	2	3	5	2	2.8	1.30
6	5	2	2	4	2	3.0	1.41
7	2	2	1	1	2	1.6	0.55
8	3	6	3	2	3	3.4	1.52
9	2	3	3	2	3	2.6	0.55
10	3	2	4	4	1	2.8	1.30
11	3	3	3	3	2	2.8	0.45
12	5	3	3	2	5	3.6	1.34
13	3	3	3	3	3	3.0	0.00
14	2	1	3	3	3	2.4	0.89
15	2	3	1	2	2	2.0	0.71
16	3	3	2	2	3	2.6	0.55
17	2	3	5	4	4	3.6	1.14
18	2	1	1	3	2	1.8	0.84
19	2	2	2	4	3	2.6	0.89
20	3	3	3	2	3	2.8	0.45
21	3	3	5	4	4	3.8	0.84
22	2	3	2	3	2	2.4	0.55
23	4	3	3	4	5	3.8	0.84
24	3	2	2	2	2	2.2	0.45
25	2	2	4	2	4	2.8	1.10
26	4	4	4	4	4	4.0	0.00
27	4	4	4	4	4	4.0	0.00
28	3	5	3	2	5	3.6	1.34
29	3	3	2	2	2	2.4	0.55
30	3	3	3	2	3	2.8	0.45
31	3	3	2	2	3	2.6	0.55
32	3	3	2	7	6	4.2	2.17
33	3	3	5	5	2	3.6	1.34
34	2	3	3	3	4	3.0	0.71
35	5	1	2	2	1	2.2	1.64
36	4	3	2	2	2	2.6	0.89
37	3	2	4	2	3	2.8	0.84

Table 8, continued

38	4	4	4	4	4	4.0	0.00
39	3	3	3	3	3	3.0	0.00
40	4	4	4	4	4	4.0	0.00
					GRAND MEAN	2.9	0.77
					Mode	3.0	

Although there was variability between and among session ratings, both grand mean (2.9) and calculated mode (3.0) of all participant responses across the five practice sessions indicated that participants, on the whole, considered themselves "Somewhat efficient" in their use of practice time.

Table 9 shows overall percentages of participant responses to each of the Likert-type categories across all five practice sessions in descending order of expression.

Table 9

Percentages of All Participants' Likert-type Responses to Session Questionnaires Across All Five Practice Sessions

Likert Response	Percentage
3 "Somewhat efficiently"	37.5
2 "Very efficiently"	32.0
4 "Neither efficiently nor inefficiently"	17.5
5 "Somewhat inefficiently"	6.0
1 "Extremely efficiently"	5.5
6 "Very inefficiently"	1.0
7 "Extremely inefficiently"	0.5

These data indicated that, on average, participants appeared to avoid rating their practice efficiencies at either extreme of the scale.

***RQ 5 disaggregations: Likert-type responses from Session Questionnaires*.** Tables J1 – J11 (Appendix J) present differences between session questionnaire self-evaluations of practice time efficiency according to participants' sex, level of study, degree emphasis, and years of voice

study. On the whole, as based on averages, (a) female participants thought they used their practice times slightly more efficiently than males, (b) undergraduate participants rated themselves slightly more efficient than graduate students, (c) vocal performance majors indicated a slightly higher estimation of practice time efficiency than non-performance majors, and (d) participants with more years of voice lessons considered their practice sessions to be more efficient than students with comparatively fewer years of voice lessons.

However, none of these comparisons yielded a significant difference: (a) male vs female, $t(38) = -0.80$, $p = 0.42$: (b) undergraduate vs graduate, $t(38) = -0.71$, $p = 0.48$; (c) vocal performance vs non-performance major, $t(38) = -0.37$, $p = 0.70$; and (d) according to reported years of voice lessons, (F (4,35) = 0.18, $p = 0.94$).

Summary: Research question two. Although individual differences between estimated and actual practice times varied considerably, most participants (n = 22, 59.4%) overestimated their actual practice time, on average, by 24 minutes. All paired groups of disaggregated data indicated this mean tendency to overestimate was consistent, regardless of sex, level of study, degree emphasis, and years of voice lessons, and there were no significant differences between paired groups.

The number of days participants estimated they practiced each week ranged from 1-7 (M = 5.025, SD = 1.25). No graduate students indicated practicing 7 days a week. Twenty-six participants (65%) indicated following an established practice routine, whereas 14 (35%) indicated they did not do so. Participants who described their routines typically mentioned a warm-up to begin with as well as repertoire study. A significantly greater percentage of females (72.7%) followed an established practice routine than males (55.5%). More graduate students (72.2%) followed an established practice routine than undergraduate students (59.1%), although

this difference was non-significant. A significantly greater percentage of vocal performance majors (72.4%) followed an established practice routine than non-performance majors (45.4%). A significantly greater percentage of participants followed an established routine when practicing voice as experience increased.

Participants on average indicated they followed a voice teacher's advice when practicing voice more frequently than not (Q7: $M = 6.25$, $SD = 1.21$), and they responded positively in general when asked if they liked practicing voice (Q1: $M = 5.53$, $SD = 1.38$). However, participants indicated infrequently consulting written resources to help them in their voice practice (Q8: $M = 2.75$, $SD = 1.60$). The only statistically significant difference between disaggregated groups for Likert-type items 1-8 pertaining to practice attitudes and strategies was between undergraduate and graduate students on Q6, where undergraduate students reported receiving instruction from a studio voice teacher as to how to practice independently significantly more frequently than graduate students.

The responses to the first activity during practice in descending order of frequency were: "Vocal warm-up exercise" ($n = 30$ [75%]), "Technical exercises and scales" ($n = 6$ [15%]), and "Non-vocal warm-up exercise" ($n = 4$ [10%]). A series of *t*-tests found significant differences in the responses to first activity during practice between: (a) undergraduates and graduate students, (b) vocal performance majors and non-performance majors, and (c) various reported years of voice lessons.

With respect to initial activity when learning new repertoire, most participants reported "Listening to a recording of the piece." However, there were significant differences between responses of undergraduate and graduate students, and among groups of participants reporting varying years of voice lessons.

On the whole, participants indicated they used their time "somewhat efficiently" during recorded practice sessions. Participants who reported more years of voice lessons tended to think they made slightly more efficient use of their time than participants with fewer years of voice lessons.

Research Question Three: Observed Practice Behaviors

The third research question asked what specific audible behaviors participants exhibited during the first 15 minutes of practice, as measured by quantitative content analysis procedures (Krippendorff, 2004). I analyzed the first 15 minutes of audio from each practice session and recorded durations of behaviors according to the following ten exhaustive and mutually exclusive behavior categories: Silence, Breath Activation Exercises, Speaking Voice [non-repertoire], Speaking Voice [repertoire], Singing Voice [non-repertoire], Singing Voice [repertoire], Rhythmic Exercise [no text or keyboard], Keyboard Only, Non-Keyboard Electronic Practice Aid (NKEPA) [no voicing], and NKEPA [voicing].

Two experts in vocal music education each analyzed independently 25 randomly-selected recordings (12.5% of all recordings), resulting in 50 recordings (25% of all recordings) analyzed independently by two persons, the researcher and one of the independent experts. Obtained inter-rater reliability was .95.

Practice behaviors: All participants across all practice sessions. Figure 1 displays the aggregated mean percentages of time spent in each behavioral category by all participants during the first 15 minutes of practice across all five practice sessions.

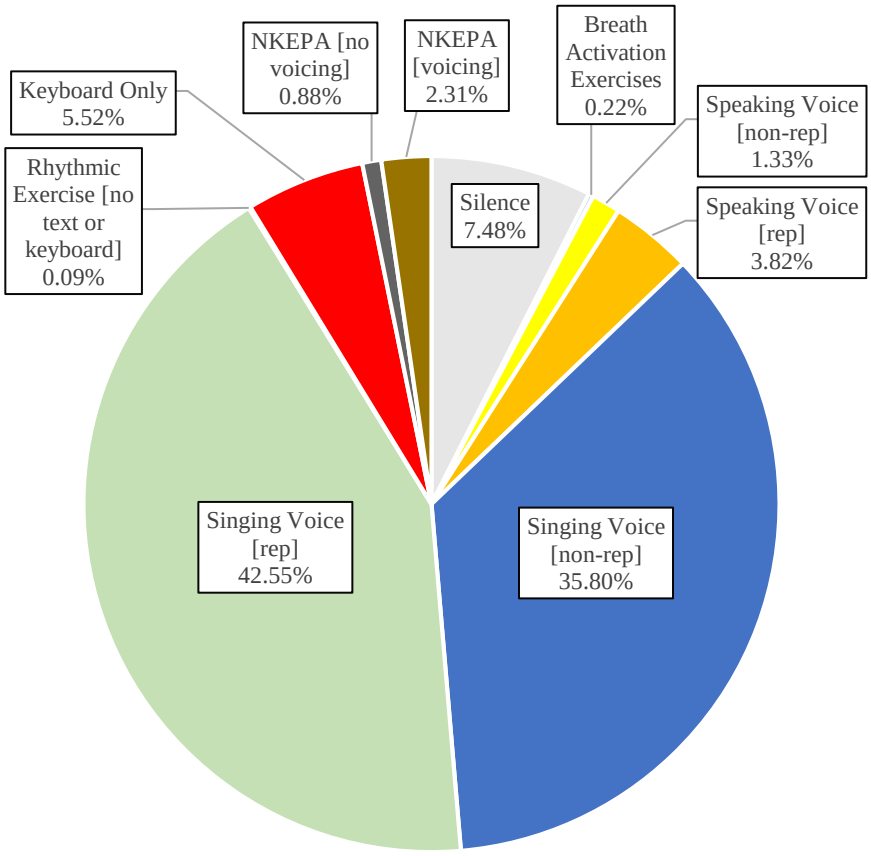

Figure 1. Aggregated mean percentages of time spent during the first 15 minutes across all participants' (N = 40) practice sessions

Participants on average devoted the largest percentage (42.55%) of overall time spent during the first 15 minutes of practicing to singing repertoire. Another category directly related to repertoire (Speaking Voice [repertoire]) accounted for 3.82% of the overall time spent practicing, while time spent on Rhythmic Exercise (0.09%) was almost exclusively devoted to practicing rhythms within repertoire selections. Combining these categories, participants on average spent 46.46% of their time within the first 15 minutes of their five practice sessions on repertoire-related practice activities.

The second largest percentage (35.80%) of overall time spent within the first 15 minutes of practicing was devoted to singing exercises consisting of vocal warm-ups, vocalizes, and other

vocal technical exercises. Combined with Breath Activation Exercises (0.22%), participants spent 36.02% of their time addressing technique, both voiced and unvoiced.

Participants exhibited Keyboard Only (5.52%), NKEPA [no voicing] (0.88%), and NKEPA [voicing] (2.31%) behaviors during both repertoire study and technical exercises. The Speaking Voice [non-rep] behaviors (1.33%) consisted of self-narratives by participants, mutterings of frustration, exclamations of success, or from one participant two brief (<10 s) messages addressed to the researcher directly. During periods of participant Silence (7.48%), I heard mostly the rustling of pages, the moving of furniture, the opening and closing of doors, the packing and unpacking of bags, drinking from water bottles, the tapping or clicking of mobile phones, and in one instance the brief sounding of a fire alarm.

RQ 5 disaggregations: Aggregate practice behaviors by participants across all five practice sessions. Figures K1 – K11 (Appendix K) present differences between evidenced practice behaviors according to participants' sex, level of study, degree emphasis, and years of voice study. For the following statistical analyses, I reduced the original 10 categories to three broad behavioral categories: (a) Repertoire, combining the categories of Singing Voice [repertoire], Speaking Voice [repertoire], and Rhythmic Exercises); (b) Technique, combining Singing Voice [non-repertoire] and Breathing Exercises; and (c) Manual Behaviors and Silence, combining Keyboard Only, NKEPA [no voicing], NKEPA [voicing], and Silence.

Female vs male participants. Female participants, in descending order of percentage of measured time, engaged with: (a) Repertoire (48.44%), (b) Technique (35.83%), and (c) Manual Behaviors and Silence (15.73%). Male participants engaged with: (a) Repertoire (44.06%), (b) Technique (36.25%), and (c) Manual Behaviors and Silence (19.69%). These contrasting distributions of focus, however, were not significant, χ^2 (2) = 0.67, p = 0.71.

Undergraduate vs graduate participants. Undergraduate singers spent their time with: (a) Repertoire (43.92%), (b) Technique (34.43%), and (c) Manual Behaviors and Silence (21.65%). Graduate singers engaged with: (a) Repertoire (49.69%), (b) Technique (38.04%), and (c) Manual Behaviors and Silence (12.27%). These contrasting distributions according to level of study were not significantly different, χ^2 (2) = 3.24, p = 0.19.

Vocal Performance vs non-performance majors. Vocal performance majors distributed their time as follows: (a) Repertoire (43.99%), (b) Technique (41.59%), and (c) Manual Behaviors and Silence (14.42%). Non-performance majors engaged with: (a) Repertoire (52.75%), (b) Technique (21.83%), and (c) Manual Behaviors and Silence (25.42%). A chi-square test of independence determined that these differences between vocal performance majors and non-performance majors were significant, χ^2 (2) = 10.06, p < .05.

Reported years of voice study. Table 10 displays percentages of measured time spent according to reported years of voice lessons.

Table 10

Percentages of Time Spent According to Reported years of Voice Lessons.

	Percentage of Time Spent				
Category	<1 Year	1-2 Years	3-5 Years	6-9 Years	10+ Years
Repertoire	57.25	49.93	43.17	41.32	48.55
Technique	21.03	20.82	40.23	42.69	38.80
Manual Behaviors and Silence	21.72	29.25	16.60	15.99	12.65

A chi-square test of independence determined that these differences in percentages of time distribution according to reported years of voice lessons were significant, χ^2 (8) = 26.42, p < .05. Participants who reported more years of voice lessons spent significantly more time on non-repertoire-related practice and significantly less time in other behavioral categories than participants with fewer years of voice lessons.

Individual participants. Figures L1 – L240 (Appendix L) provide an overview of each participant's time use and a chronological sequence of each participant's behaviors within their practice sessions.

Research Question Four: First Observed Practice Behaviors

The fourth research question asked what specific audible behavior participants exhibited first during each of their practice sessions. For the purpose of RQ 4 analysis, only audible activities with a duration of 10 seconds or longer qualified as a first audible behavior. Table 11 shows: (a) participants' first audible behavior during each practice session, (b) calculated mode of first audible practice behaviors across their five sessions, and, for comparison purposes, (c) participants' initial questionnaire reports of how they typically began their practice sessions.

Table 11

All Participants' (N = 40) First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
1	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-vocal Warm-up Exercise
2	Keyboard Only	Singing Voice [rep]	Singing Voice [rep]	Keyboard Only	Keyboard Only	Keyboard Only	Vocal Warm-up Exercise
3	Singing Voice [non-rep]	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Vocal Warm-up Exercise
4	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
5	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
6	Singing Voice [non-rep]	Singing Voice [non-rep]	Speaking Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
7	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
8	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
9	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
10	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
11	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
12	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [rep]	Breath Activation Exercises	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
13	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Non-vocal Warm-up Exercise

Table 11, continued

14	Singing Voice [non-rep]	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
15	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
16	Singing Voice [non-rep]	Speaking Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
17	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
18	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
19	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
20	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
21	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Vocal Warm-up Exercise
22	Singing Voice [rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
23	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
24	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [rep]	Vocal Warm-up Exercise
25	Singing Voice [non-rep]	Singing Voice [rep]	Keyboard Only	Keyboard Only	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
26	Singing Voice [non-rep]	Singing Voice [non-rep]	Speaking Voice [rep]	Speaking Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
27	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
28	Keyboard Only	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Vocal Warm-up Exercise
29	Singing Voice [non-rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Speaking Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise

Table 11, continued

30	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
31	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-vocal Warm-up Exercise
32	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Vocal Warm-up Exercise
33	Keyboard Only	Non-Keyboard Electronic Practice Aid [voicing]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Keyboard Only	Vocal Warm-up Exercise
34	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
35	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
36	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
37	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-vocal Warm-up Exercise
38	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Speaking Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
39	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
40	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercise

Note. P = Participant

Of the 200 individual practice sessions examined, most (n = 141, 70.5%) began with a Singing Voice [non-rep] behavior. Thirty-four (85%) participants evidenced Singing Voice [non-rep] as their modal, or most frequent, starting behavior across five practice sessions, and most

(n = 36, 90%) participants indicated prior to practice session recordings that they typically began practice with either "Vocal Warm-up Exercise" (n = 30, 75%) or "Technical Exercises or Scales" (n = 6, 15%). There was no significant difference between modal and previously described first practice behaviors, χ^2 (1) = 1.14, p = 0.28, indicating that most participants evidenced congruence between their previously described starting behaviors and their actual, first modal behaviors.

Other observed first practice behaviors included, in descending order of frequency, Singing Voice [rep] (n = 34), Keyboard Only (n = 12), Breath Activation Exercises (n = 6), Speaking Voice [rep] (n = 5), Non-Keyboard Electronic Practice Aid (n = 1), and Speaking Voice [non-rep] (n = 1).

RQ 5 disaggregations: First observed practice behaviors. Tables M1 – M11 (Appendix M) present actual and described first audible behaviors according to participants' sex, level of study, degree emphasis, and years of voice study.

Female vs male participants. Chi square goodness of fit tests indicated no significant differences between modal and previously described first behaviors among female participants, χ^2 (1) = 1.05, p = 0.30, yet there were significant differences between modal and previously described first behaviors among male participants, χ^2 (1) = 11.91, $p < .05$.

Undergraduate vs graduate participants. Chi square goodness of fit tests indicated no significant differences between modal and previously described first behaviors among undergraduate participants, χ^2 (1) = 1.05, p = 0.30, and graduate participants, χ^2 (1) = 1.31, p = 0.25.

Vocal performance vs non-performance majors. A chi square goodness of fit test indicated no significant differences between modal and previously described first behaviors

among vocal performance majors, χ^2 (1) = 0.44, p = 0.50, and a Fisher's exact test yielded no significant differences between modal and previously described first behaviors among non-performance majors, p = 0.50.

Reported years of voice lessons. A series of Fisher's exact tests yielded no significant differences between modal and previously described first behaviors among participants reporting (a) less than one year of voice lessons, p = 1.00, (b) 1-2 years of voice lessons, p = 0.45, (c) 3-5 years of voice lessons, p = 1.00, (d) 6-9 years of voice lessons, p = 1.00, and (e) 10 or more years of voice lessons, p = 1.00.

CHAPTER FIVE

Discussion

The present study appears to be the first investigation to examine the audible behaviors and expressed attitudes of university vocalists ($N = 40$) across five self-guided practice sessions, with attention to (a) duration of practice sessions compared to previously expressed estimations, (b) participants' attitudes, and strategies with respect to vocal practicing, and (c) audible behaviors occurring during the first 15 minutes of practice. Whereas previous practice studies have included single observations of comparatively smaller numbers of vocalists, this investigation contributes to existing research literature by focusing solely on 40 vocalists from multiple universities in two different countries as they went about their practicing across multiple sessions. Moreover, this study provides a comprehensive, session by session snapshot of the chronological sequence of events that transpire in the first 15 minutes of 200 individual voice practice sessions.

Among primary results: (a) Singers overall evidence during the course of this study a mean practice session duration of 28 minutes. However, durations vary widely and idiosyncratically among participants and across the five recorded sessions. (b) There are significant differences in practice durations between male and female participants, and among some participants grouped according to reported years of voice lessons (<1-3 years and 6-9 years). (c) Mean estimations of participants' practice durations based on prior questionnaire data exceed by nine minutes actual mean practice time. This tendency to overestimate time devoted to practice occurred as well in all group disaggregations. (d) A majority (65%) of singers report they follow an established practice routine, including a significantly greater percentage of female than male participants and a significantly greater percentage of students reporting more than

three years of prior voice lessons than those reporting fewer years. Undergraduate students indicate to a significantly greater extent than graduate students they had received advice on how to practice from a studio voice teacher. (e) Participants, on average, say they practice 5 days per week. (f) Analyses of the first 15 minutes of recorded lessons indicate these voice students on average spend the largest percentage of their time (43%) on singing of repertoire, and the second largest percentage of practice time (36%) on warm-ups and vocal technical exercises, with non-performance majors spending significantly more time on repertoire and less time on technique than voice performance majors. To a significant degree, practice time devoted to technique generally increases and time devoted to repertoire generally decreases as years of reported voice lessons (<1 – 9 years) increase. (g) Among participants overall, results indicate no significant difference between previously described modal first vocal practice behaviors that address warming up and technique and actual, demonstrated first behaviors. Of the 200 individual practice sessions examined, 141 (70.5%) begin with singing not focused on repertoire.

Results are limited to the particular participants and procedures of this investigation. Nonetheless, these data afford food for thought with respect to vocal pedagogy, current advice from professional literature, suggestions for further research, and some limitations of the study.

Given the aggregate picture that emerges from the data of this snapshot investigation, voice teachers may be tempted to sigh with either relief or dismay, depending on their perspectives: These voice student participants, on average, practice five days per week for a duration of 28 minutes per session, although they may think they practice longer; they report having an established practice routine; and they devote, particularly as their experience and level of study increases, more practice time during the first 15 minutes of practice to vocal technique than to repertoire rehearsal.

Voice teachers, however, may not teach students who conform precisely to this averaged, aggregate picture of practice behaviors and attitudes. Indeed, a student who exhibits exactly each one of these attributes does not exist even within the confines of this study. Therefore, while acknowledging mean and majority findings, the following discussion focuses upon addressing thematically some selected matters of interest arising from results of this study, matters that may have implications for individualizing the advice voice teachers offer their students.

How Long Students Practice and How Often They Say They Practice

"Practice makes perfect," as the saying goes. By design, this quantitative investigation assumes that practicing is a desirable behavior for voice students, and it seeks to document, primarily in terms of duration and sequencing, how participating voice students spend their time when practicing. This approach constitutes a logical, first step in researching an under-investigated area relevant to vocal pedagogy.

Some previous studies (e.g., Madsen, 2004) indicate that music students tend consistently to overestimate the time they devote to practicing their instruments. Data from the present study confirm such previous findings. Although some participants underestimate practice time, on average the singers participating in this investigation tend to overestimate duration of practice time by about 32%. That is, they may perceive they spend almost a third more time per practice session than they do.

The derived estimations used in this study, while legitimate, could have been avoided had I thought beforehand to word the initial participant questionnaire to obtain self-estimates of practice time in terms of minutes per practice session. Subsequent studies should not overlook inclusion of such a questionnaire item.

Some previous studies suggest that the amount of time devoted to practice may contribute to ultimate achievement. Sloboda and colleagues (1996), for example, find a strong positive relationship between performance achievement and the amount of time devoted to formal practice. McPherson and McCormick (1999) suggest that students who devote more time to practice express more interest and exhibit more cognitive engagement than students who practice for lesser amounts of time.

However, research and advice from professional literature alike tend to shy away from prescriptions regarding duration of practice sessions, perhaps with good reason. One exception to that policy in the professional literature speculates a desirable practice session duration of 45 minutes (Dayme and Vaughn, 2008). Were one to assume this speculation has some evidence-based foundation, then participants in this study, on average, fall short of that standard by some 17 minutes.

Singers, unlike players of manufactured musical instruments, rely upon an embodied instrument. The physiology of efficient singing relies on development of the delicate coordination of consistently simultaneous onsets, maintaining ideal pharyngeal-oral shapes, and laryngeal stability, all while ensuring no extraneous muscular tension. This balancing act requires time spent relaxing the apparatus, but also the regularity of use that aids development of "muscle memory" as well as endurance of the intrinsic laryngeal muscles and those required to shape the vocal tract, much in the same way athletes would condition their muscles. Indeed, some literature (e.g. Alderson, 1979) equates vocal practice to athletic training in this regard. Thus, looking at durations of practice sessions may have physiological as well as pedagogical implications.

One result of this study is that female participants, on average, appear to practice for significantly more time across their practice sessions than male singer participants. Subsequent

studies may well wish to examine with larger numbers of female participants whether this finding is simply an artifact of the particular group of female singers participating in this study. This matter merits further attention because female singers phonate at higher frequencies than males. Thus, depending on the repertoire and vocal technique exercises pursued, it may be advisable that females practice for shorter durations of time per session. Of potential concern would be the pitch-amplitude effect, where higher frequencies abet stronger collisions of the vocal folds. Thus, depending on the tessiturae of the vocal literature and technical exercises sung, as well as the acoustical properties of the practice room, duration of practice time may interact adversely with optimal singing voice efficiency and attention to voice care. In this respect, it may be instructive to have some female participants in future practice behavior studies wear an ambulatory phonation monitor and noise dosimeter as they record their practice sessions.

Furthermore, females pursuing careers as vocalists often face very fierce competition at auditions compared to their male counterparts. Many sopranos, for example, struggle to find opportunities in young artist programs and professional settings because of the sheer number of other sopranos vying for the roles offered. Male voices generally may not experience that volume of competition. As such, future research might explore the degree to which female singers may feel pressured to practice for longer in order to beat out their competition.

When it addresses the matter, professional literature tends to advise students to practice daily six or more days per week (e.g., Klickstein. 2009; Dayme & Vaughn, 2008). Participants in the current study apparently fall slightly short of such advice, reporting that they practice, on average, five days per week, although reports vary, ranging from 1 day to 7 days per week.

How Students Spend Their Time Practicing and How Well They Spend It

The present study, by design, examines practice sessions by looking at quantities and percentages of time devoted within the first 15 minutes of practice during multiple sessions to various categories of behaviors. In that respect, the two largest percentages of time spent reflect, on average, attention to repertoire (46.5%) and vocal technique (36%), with lesser percentages of time devoted to periods of participant silence (7.5%), playing the keyboard (5.5%), using non-keyboard electronic practices aids (3.2%), and non-repertoire related speaking voice behaviors (1.3%).

On one hand, it may be reassuring to note that these students address matters of vocal technique inclusive of vocal warm-ups during their first 15 minutes of practice. On the other hand, devoting 5 minutes 24 seconds to technique, on average, during the first segment of practice may concern some voice teachers, particularly with respect to students in early stages of studio voice lessons. Disaggregated data speak to that point, in that time spent on technique increases with reported years of voice lessons and nearly doubles when comparing voice performance majors to non-performance majors. Voice teachers may well wish to consider whether less experienced singers require more frequent, intentional advising, or perhaps even monitoring, on this matter.

Insufficiently addressed by the present study is how well students spend their practice times, that is, the quality and efficiency of student practicing. That matter is a logical, next step in researching practice behaviors of singers.

Self-rating responses at the end of each practice session suggest that participants in this study tend to perceive their practicing as “somewhat” efficient. Future studies might incorporate ratings by students’ studio voice teachers. For example, participants might present recordings of

their practice sessions to their studio voice teachers, who would then rate and comment upon practice efficiency in terms of mutually-agreed upon voice development goals. Analyzing differences and commonalities between student self-ratings and studio teacher ratings could be instructive.

Subsequent studies might incorporate sharing with voice teachers individualized quantitative analyses of each practice session, such as those presented by the 240 figures in Appendix L showing per each student percentages of time spent and a chronological sequence of practice events. To ascertain whether such analyses could impact voice teacher ratings of their students' practicing, researchers might present such quantitative analyses to one group of voice teachers before they begin their ratings, to another group of voice teachers toward the end of the rating process, and for control purposes withhold them from still another group of voice teachers.

Alternatively, other studies might encourage and train voice teachers with respect to using software, such as the *CowLog 3.0.2* program used in this study. Studio teachers could thereby design and implement their own, preferred assessment categories for reviewing recordings of student practice sessions. This study documents the feasibility of using up to ten categories. Voice teachers, however, may well decide they could use fewer or more categories of assessment.

In a study with 13 voice students, Frey-Monell (2011) finds that students empowered to create and apply their own criteria for self-assessment of practicing report improved time management and preparation for lessons. Future studies might explore the use and feasibility of student-created criteria as a dependent measure with greater numbers of participants.

Sequencing of practice events. As indicated by figures (Appendix L) illustrating the chronological sequence of measured student behaviors during the first 15 minutes of each of the

200 practice sessions examined for this study, participants rarely devote this entire segment of practice time to a single behavior. On the other hand, most practice sessions (*n* = 141, 70.5%) begin similarly, with a sung behavior not exclusively focused upon repertoire. Participants, moreover, indicate stability between prior statements of first practice behaviors and actual, modal first practice behaviors. In other words, most participants do what they said they would do in this respect, with 90% (*n* = 36) indicating they typically began practice with non-repertoire singing (i.e., vocal warm-up exercises and technical exercises or scales), and 85% (*n* = 34) evidencing non-repertoire singing as their modal, beginning of practice behavior. Interestingly, however, the percentage of male participants who do not exhibit such congruence significantly exceeds the percentage of female participants deviating from previously expressed first practice behavior.

Future studies should examine to a greater level of specificity (a) how particular voice students sequence their practice behaviors and (b) whether some sequences may be more effective than others for individual students. For example, data from the present study show that students may vary practice of repertoire with attention to breath activation exercises or attention to vocal technique exercises. What these data are unable to show, however, is precisely how students attend to practice of repertoire or technique.

Previous studies (e.g., Leon-Guerro, 2008; Rohwer &Polk, 2006) indicate repetition is the most frequent practice behavior exhibited by the participants examined. However, it may matter how that repetition is structured and sequenced.

For instance, some preliminary research (Carter & Grahn, 2016) indicates that interleaved or random practice, wherein clarinetists execute an action (e.g., a difficult trill or melodic segment appearing in a particular piece of literature) multiple times dispersed throughout the

practice session, rather than in one bunched, block group of repetitions, may lead to better replication and retention outside of the practice context. In a study with eighth grade instrumentalists, Rohwer and Polk (2006) find students who jump around in the score to fix errors show significantly greater improvement in performance than those who fix errors encountered when rehearsing the score chronologically.

Future research might explore these matters with vocalists. Quantitative procedures like those employed in the present study could assist in this endeavor. Behavioral analysis categories, for instance, might be confined exclusively to sung repertoire behaviors, thereby permitting expansion of categories applied beyond the unitary "Singing Voice [repertoire]" category employed for this study. Likewise, researchers might employ categories designed to quantify varied approaches to error correction.

Germane to this point is the saying, "Practice smarter, not longer" (Duke, et al., 2009). Although offered largely from an instrumental music perspective, some advice from professional literature (e.g., Kageyama, 2013; Klickstein, 2009) advocates shorter, rather than longer, practice sessions to maximize concentration and not waste time. From a singer's perspective, shorter sessions focused on quality of time spent may also minimize potential threats to stamina and voice care.

These professional resources tend not to specify what timeframe constitutes a "shorter" rather than "longer" practice session, likely with good reason. It is doubtful, from a pedagogical perspective, that a "one size fits all" prescription for practice session or even practice segment duration would benefit particular students working with particular voice teachers on particular matters of singing voice development.

General Attitudes, Routines, and Missing Context

On the whole, participants in the present study say they enjoy practicing "most of the time," and that, overall, they find it easy to focus when practicing. Most participants (65%) indicate they follow an established practice routine, with females, particularly female graduate performance majors, expressing this inclination more than male participants. The most frequently mentioned ingredients of such routines are beginning with a warm-up followed by engagement with repertoire.

However, missing from this picture and missing generally from interpretation of other data pictures in this study is some notion of context beyond the disaggregated variables examined. We do not know from data of this study, for instance, why some students may not adhere to an established practice routine or why, by extrapolation, students may not enjoy practicing "some of the time" or sometimes find it less easy to focus while practicing. Similarly, we do not know why students may practice for the durations of time documented by this study or why, for instance, one doctoral student in vocal performance (Participant 27) practices on average for 5 minutes across the five sessions examined, with her longest recorded session lasting 6.5 minutes.

Designs of subsequent studies should not overlook inclusion of student-generated contextual information through questionnaires, interviews, or logs. For instance, should part time job responsibilities or a particularly heavy academic or performance schedule inform student decisions about practicing, it would be helpful to know that. Likewise, it would be helpful to know any atypical demands on student time coinciding with the time period they recorded their practice sessions, or if they generally felt well or not. There could be any number of reasonable explanations why Participant 27 practices for 5 minutes or why other participants practice for

shorter durations on some occasions and longer durations on others if we had such contextual information.

Teacher Advice on Practicing

Most participants (n = 37, 92.5%) report having received advice from their studio voice instructors relative to independent practicing. As might be expected, more undergraduate than graduate students say they have received such advice. Interestingly, participant responses on average indicate they "frequently" rather than "always" listen to advice received from teachers.

In a study of 241 wind instrumentalists, Mikza and Tan (2015) find that what students do in individual practice tends not to match advice on practice strategies offered by their studio teachers. One limitation of the present study is its neglecting to inquire what, specifically, studio voice teachers have advised students to do when practicing. Therefore, future studies should inquire, whether by questionnaire or interview, what students recall their teachers saying about practice strategies and behaviors. Such studies may wish to interview the studio teachers as well, to establish the degree to which student recollections and teacher advice converge.

Student voice practicing, in a potentially important sense, is akin to homework in other disciplines. With respect to this homework, voice teachers may be either laizzez-faire, e.g., "you should do some homework," "you should try some of this, some of that," or intentional, e.g., "implement this particular strategy," "I will assess your practicing according to these rubrics or standards." Typically, instructors in other subject matter domains assess homework in some intentional fashion, either by simple acknowledgments of satisfactory completion, comments or suggestions for improvements, or by means of a rating or grade.

Some anecdotal experience suggests voice teachers may be less intentional about this homework assessment process than their counterparts in other disciplines. In such instances,

studio voice teachers may appear to trust in the sufficiency of a frequently heard global belief, “I can hear whether you practiced or not,” without necessarily considering precisely how what they hear, presumably a result of practice, comports with specific, desirable behaviors of successive approximation.

The finely-honed listening and observational skills of experienced voice teachers can diagnose with accuracy a student’s vocal behaviors during studio lessons. However, determining the degree to which practicing or lack of practice contributes, positively or negatively, to what teachers hear at that moment may be a different matter. Researchers can assist voice teachers to become more intentional with respect to assessment of student practice in relation to teacher expectations by continuing to investigate what transpires in voice practice sessions and what may or may not constitute “best practice” use of student time.

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Appendix A

Human Subjects Approval Letter

THE UNIVERSITY OF KANSAS
Research

APPROVAL OF PROTOCOL

February 23, 2017

Alan Martin
alanmartin@ku.edu

Dear Alan Martin:

On 2/23/2017, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	BEHIND CLOSED DOORS: AN ANALYSIS OF THE BEHAVIORS AND PERCEPTIONS OF UNIVERSITY VOICE STUDENTS DURING FIVE INDEPENDENTLY LED PRACTICE SESSIONS.
Investigator:	Alan Martin
IRB ID:	STUDY00140648
Funding:	None
Grant ID:	None
Documents Reviewed:	• HRPP_signed_consent_form_ 7_13.docx, • HSCL-NewSubmission-Form-V3.pdf, • Recruitment Document.docx, • Practice Questionnaire.docx, • Session Questionnaire.docx

The IRB approved the study on 2/23/2017.

1. Notify HSCL about any new investigators not named in original application. Note that new investigators must take the online tutorial at https://rgs.drupal.ku.edu/human_subjects_compliance_training.
2. Any injury to a subject because of the research procedure must be reported immediately.
3. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity.

Continuing review is not required for this project, however you are required to report any significant changes to the protocol prior to altering the project.

Please note university data security and handling requirements for your project:
https://documents.ku.edu/policies/IT/DataClassificationandHandlingProceduresGuide.htm

You must use the final, watermarked version of the consent form, available under the "Documents" tab in eCompliance.

Sincerely,

Stephanie Dyson Elms, MPA
IRB Administrator, KU Lawrence Campus

Human Research Protection Program
Youngberg Hall | 2385 Irving Hill Rd | Lawrence, KS 66045 | (785) 864-7429 | research.ku.edu/hrpp

Appendix B

Approved Participant Consent Form

Adult Informed Consent Statement

BEHIND CLOSED DOORS: AN ANALYSIS OF THE BEHAVIORS AND PERCEPTIONS OF UNIVERSITY VOICE STUDENTS DURING FIVE INDEPENDENTLY LED PRACTICE SESSIONS.

INTRODUCTION

The Department of Music Education and Music Therapy at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you do withdraw from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

PURPOSE OF THE STUDY

The purpose of this study is to document the duration of singers' practice sessions, document singers' practice behaviors during practice through audio-recording analyses, and collect questionnaire data regarding singers' scheduling, strategies, and attitudes towards practicing during five independently led practice sessions.

PROCEDURES

Initial Questionnaire.

You will be asked to complete a questionnaire about your typical practice, including your habits, strategies, and attitude towards practicing. The questionnaire includes four sections: (a) demographic information, (b) practice frequency and duration, (c) practice strategies, and (d) attitudes towards practicing. You will complete the questionnaire online through Google Forms. The questionnaire should take no more than 10 minutes to complete.

Practice Venues.

You will complete five audio-recorded practice sessions. You will have the freedom to practice in a venue of your choice over the course of the study, and without a requirement to practice in the same venue each time. However you are limited to using venues in which you have previously practiced so that a new venue is not a confounding variable. The venue may be a university-designated practice room or rehearsal room, your home, a community music rehearsal space, or any other venue you deem suitable for practice.

Practice Recordings.

You will audio-record five practice sessions using a digital device of your convenience. You may use a personal smartphone or other portable multi-application device to audio record their sessions, or you may use a computer or a dedicated audio recording device. All devices should record audio in .mp3, .aac, or .wav format. You will start the recording the moment they enter the practice space and to stop the recording the moment you leave the practice space. You have the freedom to practice any material and in any way that corresponds to your studio assignments and goals, and you may choose the length of each

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practice session. You will either e-mail the recordings to the researcher (alanmartin@ku.edu) or upload all session recordings to an online source from which the researcher can download the files.

Session Questionnaire.
You will complete a one-item post-session questionnaire after each of your five practice sessions. You will rate your practice efficiency five times (once per session) using Google Forms within 24-hours after each practice session.

RISKS

There is no foreseeable risk to participating in this study. You will not be asked to change your routine or do anything you would not normally do as part of your normal practice regimen.

BENEFITS

You may learn more about your practice habits and practice efficiency. These data can also be very useful for singers and voice teachers. Knowing how singers typically structure their practice sessions, how long they practice, and what they do in practice sessions can help future singers and voice teachers strategize their practice or instruction to maximize efficiency.

PAYMENT TO PARTICIPANTS

There will be no payment to participants

PARTICIPANT CONFIDENTIALITY

Your name will not be associated in any publication or presentation with the information collected about you or with the research findings from this study. Instead, the researcher(s) will use a study number or a pseudonym rather than your name. Your identifiable information will not be shared unless (a) it is required by law or university policy, or (b) you give written permission.

By signing this form you give permission for the use of your survey information and recording data for the purposes of this study and future studies at any time in the future. This will not include any identifiable information.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION

You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or to participate in any programs or events of the University of Kansas. However, if you refuse to sign, you cannot participate in this study.

CANCELLING THIS CONSENT AND AUTHORIZATION

You may withdraw your consent to participate in this study at any time. You also have the right to cancel your permission to use and disclose further information collected about you, in writing, at any time, by sending your written request to:
Alan Martin
576 Murphy Hall
The University of Kansas
Lawrence, KS 66045

If you cancel permission to use your information, the researchers will stop collecting additional information about you. However, the research team may use and disclose information that was gathered before they received your cancellation, as described above.

QUESTIONS ABOUT PARTICIPATION

Questions about procedures should be directed to the researcher(s) listed at the end of this consent form.

PARTICIPANT CERTIFICATION:

I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429 or (785) 864-7385, write the Human Research Protection Program (HRPP), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7568, or email irb@ku.edu.

I agree to take part in this study as a research participant. By my signature I affirm that I am at least 18 years old and that I have received a copy of this Consent and Authorization form.

_____ _____
Type/Print Participant's Name Date

_____
Participant's Signature

Researcher Contact Information

Alan Martin
Principal Investigator
576 Murphy Hall.
University of Kansas
Lawrence, KS 66045
509-741-7397

Christopher Johnson
Faculty Supervisor
MEMT Dept., Murphy Hall
University of Kansas
Lawrence, KS 66045
785-864-9633

KU Lawrence IRB # STUDY00140648 | Approval Period 2/23/2017

Appendix C

Initial Questionnaire

Initial Practice Questionnaire

Section 1 of 3

Thank you for participating in this research study. This questionnaire has three sections: demographic information, practice frequency and duration, and practice attitudes and strategies. Completion of this questionnaire should take approximately 5-10 minutes and should be completed and submitted before you begin recording your solo vocal practice sessions for this study. Please contact me at alanmartin@ku.edu if you have any questions.

* Required

1. Name *

Your answer

2. Age *

Your answer

3. What is your current level of study? *

- ◯ Undergraduate (Bachelor's)
- ◯ Graduate (Master's)
- ◯ Graduate (Doctorate)
- ◯ Other: _____

4. What is your current degree emphasis? *

- ◯ Vocal Performance
- ◯ Music Education
- ◯ Music Therapy
- ◯ Music (BA)
- ◯ Musical Theatre
- ◯ Other: _____

5. How long have you studied voice? (years, months) *

Your answer

6. Voice Type *

- ○ Soprano
- ○ Mezzo-Soprano
- ○ Alto
- ○ Tenor
- ○ Baritone
- ○ Bass
- ○ Other:

Section 2 of 3

Vocal Practice Frequency and Duration

Please fill out short answer responses to the prompts below:

1. Total time spent practicing voice per day *

Short answer text

2. How many separate vocal practice sessions do you complete each day? *

Short answer text

3. How many days a week do you practice voice? *

Short answer text

4. Do you follow an established routine for vocal practice? If so, what is it? *

Long answer text

Section 3 of 3

Vocal Practice Attitudes and Strategies

This section contains ten questions.

The first 8 questions are answered on a 7-point scale, with the following anchors:
1 = "Never"
2 = "Seldom"
3 = "Occasionally"
4 = "Half of the time"
5 = "Frequently"
6 = "Usually"
7 = "Always".

There will also be an option available for cases in which the question is not applicable or if you have no comment.

The last two questions are answered using multiple choice. You must select one of the options or insert your own by selecting "Other".

1. I like practicing voice *

- 1. Never
- 2. Seldom
- 3. Occasionally
- 4. Half of the time
- 5. Frequently
- 6. Usually
- 7. Always
- N/A or No Comment

2. I find it easy to focus on the task at hand when I practice voice *

- 1. Never
- 2. Seldom
- 3. Occasionally
- 4. Half of the time
- 5. Frequently
- 6. Usually
- 7. Always
- N/A or No Comment

3. I regularly record myself practicing voice and listen to the recordings *

- 1. Never
- 2. Seldom
- 3. Occasionally
- 4. Half of the time
- 5. Frequently
- 6. Usually
- 7. Always
- N/A or No Comment

4. I make a list of what I have to practice voice *

- 1. Never
- 2. Seldom
- 3. Occasionally
- 4. Half of the time
- 5. Frequently
- 6. Usually
- 7. Always
- N/A or No Comment

5. I set targets to achieve in each vocal practice session *

- 1. Never
- 2. Seldom
- 3. Occasionally
- 4. Half of the time
- 5. Frequently
- 6. Usually
- 7. Always
- N/A or No Comment

6. My voice teacher advises me about how to practice voice *

- 1. Never
- 2. Seldom
- 3. Occasionally
- 4. Half of the time
- 5. Frequently
- 6. Usually
- 7. Always
- N/A or No Comment

7. I use my voice teacher's advice when practicing voice *

- 1. Never
- 2. Seldom
- 3. Occasionally
- 4. Half of the time
- 5. Frequently
- 6. Usually
- 7. Always
- N/A or No Comment

8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively *

- 1. Never
- 2. Seldom
- 3. Occasionally
- 4. Half of the time
- 5. Frequently
- 6. Usually
- 7. Always

9. Most of the time I prefer to start my vocal practice sessions with: *

- ○ Non-vocal warm-up exercise
- ○ Vocal warm-up exercise
- ○ Technical exercises or scales
- ○ Sight-singing
- ○ Repertoire
- ○ Other...

10. When learning new vocal repertoire, most of the time I prefer to start by: *

- ○ Listening to a recording of the piece
- ○ Working things out just by looking at the music and not singing or playing
- ○ Speaking the text
- ○ Playing the vocal part on piano
- ○ Practicing small sections of the piece that look easier than the majority of the piece
- ○ Practicing small sections of the piece that look more difficult than the majority of the piece
- ○ Singing the piece from beginning to end without stopping
- ○ Other...

* = required field

Appendix D

Session Questionnaire

Session Form

Please fill out the information below and then rate the efficiency of your practice session. Please be sure to rate each session's efficiency within 6-hours of finishing that session. You may complete more than one practice session per day if you so wish, as long as each session is at least 15-minutes in duration, and you complete a separate session questionnaire for each individual session.

Name *

Short answer text

Practice session number *

- Practice Session 1
- Practice Session 2
- Practice Session 3
- Practice Session 4
- Practice Session 5

Date of Practice Session *

Month, day, year

Time You Started Practice Session *

Time

In your estimation, how efficiently did you spend your practice time during this session? *

- 1. Extremely efficiently
- 2. Very efficiently
- 3. Somewhat efficiently
- 4. Neither efficiently nor inefficiently
- 5. Somewhat inefficiently
- 6. Very inefficiently
- 7. Extremely inefficiently

* = required field

Appendix E

RQ 5 Disaggregations: Practice Session Durations (Research Question One).

Table E1 displays practice session duration data from female participants.

Table E1

Practice Durations for Female Participants (N = 22) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
1	0:21:38	0:18:57	0:19:57	0:51:28	0:27:53	0:27:59	0:13:35
2	0:47:25	0:31:42	0:21:27	0:34:11	0:37:12	0:34:23	0:09:23
3	0:19:36	0:17:32	0:15:25	0:18:31	0:22:37	0:18:44	0:02:40
4	0:19:02	0:50:33	0:52:59	0:15:57	0:19:29	0:31:36	0:18:29
6	1:08:30	0:57:18	0:25:40	0:22:30	1:14:28	0:49:41	0:24:12
8	0:17:40	0:21:26	0:24:48	0:24:12	0:16:16	0:20:52	0:03:49
9	0:51:59	0:38:29	0:30:01	0:45:52	0:36:33	0:40:35	0:08:31
10	0:28:45	0:20:20	0:18:32	0:17:33	0:34:43	0:23:59	0:07:27
12	0:22:34	0:37:26	0:34:14	0:48:18	0:23:16	0:33:10	0:10:43
14	0:45:35	0:42:12	0:28:57	0:33:10	0:34:14	0:36:50	0:06:51
15	0:42:00	0:20:03	0:44:28	0:41:30	0:35:03	0:36:37	0:09:53
16	0:39:01	0:46:36	1:09:44	0:48:10	0:09:41	0:42:38	0:21:41
18	0:44:23	0:50:36	1:07:44	0:40:50	0:53:19	0:51:22	0:10:24
21	0:22:28	0:21:56	0:17:12	0:35:27	0:34:58	0:26:24	0:08:18
25	0:49:13	0:18:10	0:29:59	0:28:37	0:44:00	0:34:00	0:12:31
26	0:26:23	0:26:49	0:27:18	0:25:11	0:29:16	0:26:59	0:01:30
27	0:05:17	0:04:48	0:04:48	0:03:56	0:06:30	0:05:04	0:00:56
31	0:39:06	0:18:09	0:15:27	0:28:14	0:35:08	0:27:13	0:10:19
35	0:25:39	0:17:50	0:29:29	0:21:25	0:17:52	0:22:27	0:05:05
36	0:19:10	0:16:38	0:22:44	0:16:54	0:18:24	0:18:46	0:02:27
37	0:36:14	0:26:17	0:29:18	0:51:17	0:27:15	0:34:04	0:10:23
38	0:25:04	0:20:12	0:37:12	0:22:48	0:19:52	0:25:02	0:07:08
					GRAND MEAN	0:30:23	0:14:27

Table E2 displays practice session duration data from male participants.

Table E2

Practice Durations for Male Participants (N = 18) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
5	0:31:07	0:35:41	0:39:04	0:36:58	0:34:14	0:35:25	0:02:59
7	0:10:03	0:11:01	0:15:05	0:15:00	0:11:08	0:12:27	0:02:24
11	0:23:53	0:28:03	0:16:53	0:31:58	0:33:15	0:26:48	0:06:39
13	0:05:54	0:17:49	0:13:35	0:16:07	0:13:00	0:13:17	0:04:34
17	0:30:25	0:16:04	0:23:37	0:17:15	0:18:02	0:21:05	0:05:58
19	0:35:15	0:19:55	0:36:01	0:17:37	0:30:41	0:27:54	0:08:37
20	0:27:04	0:27:04	0:28:37	0:45:14	0:22:05	0:30:01	0:08:51
22	0:19:52	0:21:52	0:27:52	0:16:48	0:28:58	0:23:04	0:05:13
23	0:45:42	0:40:05	0:47:57	0:42:13	0:30:30	0:41:17	0:06:45
24	0:35:37	0:30:21	0:31:35	0:32:44	0:27:02	0:31:28	0:03:09
28	0:29:55	0:19:23	0:27:19	0:29:23	0:22:47	0:25:45	0:04:32
29	1:18:42	0:42:04	0:39:46	0:47:07	0:37:50	0:49:06	0:16:55
30	0:15:25	0:15:17	0:15:23	0:15:48	0:15:24	0:15:27	0:00:12
32	0:20:22	0:21:34	0:21:57	0:19:51	0:21:46	0:21:06	0:00:56
33	0:16:35	0:16:24	0:17:00	0:20:53	0:17:29	0:17:40	0:01:51
34	0:35:51	0:29:24	0:21:12	0:26:59	0:17:21	0:26:09	0:07:12
39	0:16:15	0:16:25	0:14:47	0:11:50	0:17:19	0:15:19	0:02:09
40	1:10:01	0:17:17	0:17:27	0:15:17	0:16:31	0:27:19	0:23:53
					GRAND MEAN	0:25:35	0:12:10

Table E3 displays practice session duration data from undergraduate participants.

Table E3

Practice Durations for Undergraduate Participants (N = 22) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
1	0:21:38	0:18:57	0:19:57	0:51:28	0:27:53	0:27:59	0:13:35
2	0:47:25	0:31:42	0:21:27	0:34:11	0:37:12	0:34:23	0:09:23
3	0:19:36	0:17:32	0:15:25	0:18:31	0:22:37	0:18:44	0:02:40
5	0:31:07	0:35:41	0:39:04	0:36:58	0:34:14	0:35:25	0:02:59
6	1:08:30	0:57:18	0:25:40	0:22:30	1:14:28	0:49:41	0:24:12
7	0:10:03	0:11:01	0:15:05	0:15:00	0:11:08	0:12:27	0:02:24
8	0:17:40	0:21:26	0:24:48	0:24:12	0:16:16	0:20:52	0:03:49
12	0:22:34	0:37:26	0:34:14	0:48:18	0:23:16	0:33:10	0:10:43
14	0:45:35	0:42:12	0:28:57	0:33:10	0:34:14	0:36:50	0:06:51
15	0:42:00	0:20:03	0:44:28	0:41:30	0:35:03	0:36:37	0:09:53
18	0:44:23	0:50:36	1:07:44	0:40:50	0:53:19	0:51:22	0:10:24
19	0:35:15	0:19:55	0:36:01	0:17:37	0:30:41	0:27:54	0:08:37
20	0:27:04	0:27:04	0:28:37	0:45:14	0:22:05	0:30:01	0:08:51
23	0:45:42	0:40:05	0:47:57	0:42:13	0:30:30	0:41:17	0:06:45
28	0:29:55	0:19:23	0:27:19	0:29:23	0:22:47	0:25:45	0:04:32
30	0:15:25	0:15:17	0:15:23	0:15:48	0:15:24	0:15:27	0:00:12
31	0:39:06	0:18:09	0:15:27	0:28:14	0:35:08	0:27:13	0:10:19
33	0:16:35	0:16:24	0:17:00	0:20:53	0:17:29	0:17:40	0:01:51
34	0:35:51	0:29:24	0:21:12	0:26:59	0:17:21	0:26:09	0:07:12
36	0:19:10	0:16:38	0:22:44	0:16:54	0:18:24	0:18:46	0:02:27
39	0:16:15	0:16:25	0:14:47	0:11:50	0:17:19	0:15:19	0:02:09
40	1:10:01	0:17:17	0:17:27	0:15:17	0:16:31	0:27:19	0:23:53
					GRAND MEAN	0:28:39	0:13:47

Table E4 displays practice session duration data from graduate student participants.

Table E4

Practice Durations for Graduate Participants (N = 18) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
4	0:19:02	0:50:33	0:52:59	0:15:57	0:19:29	0:31:36	0:18:29
9	0:51:59	0:38:29	0:30:01	0:45:52	0:36:33	0:40:35	0:08:31
10	0:28:45	0:20:20	0:18:32	0:17:33	0:34:43	0:23:59	0:07:27
11	0:23:53	0:28:03	0:16:53	0:31:58	0:33:15	0:26:48	0:06:39
13	0:05:54	0:17:49	0:13:35	0:16:07	0:13:00	0:13:17	0:04:34
16	0:39:01	0:46:36	1:09:44	0:48:10	0:09:41	0:42:38	0:21:41
17	0:30:25	0:16:04	0:23:37	0:17:15	0:18:02	0:21:05	0:05:58
21	0:22:28	0:21:56	0:17:12	0:35:27	0:34:58	0:26:24	0:08:18
22	0:19:52	0:21:52	0:27:52	0:16:48	0:28:58	0:23:04	0:05:13
24	0:35:37	0:30:21	0:31:35	0:32:44	0:27:02	0:31:28	0:03:09
25	0:49:13	0:18:10	0:29:59	0:28:37	0:44:00	0:34:00	0:12:31
26	0:26:23	0:26:49	0:27:18	0:25:11	0:29:16	0:26:59	0:01:30
27	0:05:17	0:04:48	0:04:48	0:03:56	0:06:30	0:05:04	0:00:56
29	1:18:42	0:42:04	0:39:46	0:47:07	0:37:50	0:49:06	0:16:55
32	0:20:22	0:21:34	0:21:57	0:19:51	0:21:46	0:21:06	0:00:56
35	0:25:39	0:17:50	0:29:29	0:21:25	0:17:52	0:22:27	0:05:05
37	0:36:14	0:26:17	0:29:18	0:51:17	0:27:15	0:34:04	0:10:23
38	0:25:04	0:20:12	0:37:12	0:22:48	0:19:52	0:25:02	0:07:08
					GRAND MEAN	0:27:42	0:13:32

Table E5 displays practice session duration data from participants majoring in voice performance.

Table E5

Practice Durations for Vocal Performance Major Participants (N = 29) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
1	0:21:38	0:18:57	0:19:57	0:51:28	0:27:53	0:27:59	0:13:35
2	0:47:25	0:31:42	0:21:27	0:34:11	0:37:12	0:34:23	0:09:23
4	0:19:02	0:50:33	0:52:59	0:15:57	0:19:29	0:31:36	0:18:29
7	0:10:03	0:11:01	0:15:05	0:15:00	0:11:08	0:12:27	0:02:24
9	0:51:59	0:38:29	0:30:01	0:45:52	0:36:33	0:40:35	0:08:31
10	0:28:45	0:20:20	0:18:32	0:17:33	0:34:43	0:23:59	0:07:27
11	0:23:53	0:28:03	0:16:53	0:31:58	0:33:15	0:26:48	0:06:39
12	0:22:34	0:37:26	0:34:14	0:48:18	0:23:16	0:33:10	0:10:43
13	0:05:54	0:17:49	0:13:35	0:16:07	0:13:00	0:13:17	0:04:34
15	0:42:00	0:20:03	0:44:28	0:41:30	0:35:03	0:36:37	0:09:53
16	0:39:01	0:46:36	1:09:44	0:48:10	0:09:41	0:42:38	0:21:41
17	0:30:25	0:16:04	0:23:37	0:17:15	0:18:02	0:21:05	0:05:58
18	0:44:23	0:50:36	1:07:44	0:40:50	0:53:19	0:51:22	0:10:24
19	0:35:15	0:19:55	0:36:01	0:17:37	0:30:41	0:27:54	0:08:37
21	0:22:28	0:21:56	0:17:12	0:35:27	0:34:58	0:26:24	0:08:18
22	0:19:52	0:21:52	0:27:52	0:16:48	0:28:58	0:23:04	0:05:13
24	0:35:37	0:30:21	0:31:35	0:32:44	0:27:02	0:31:28	0:03:09
25	0:49:13	0:18:10	0:29:59	0:28:37	0:44:00	0:34:00	0:12:31
26	0:26:23	0:26:49	0:27:18	0:25:11	0:29:16	0:26:59	0:01:30
27	0:05:17	0:04:48	0:04:48	0:03:56	0:06:30	0:05:04	0:00:56
28	0:29:55	0:19:23	0:27:19	0:29:23	0:22:47	0:25:45	0:04:32
29	1:18:42	0:42:04	0:39:46	0:47:07	0:37:50	0:49:06	0:16:55
31	0:39:06	0:18:09	0:15:27	0:28:14	0:35:08	0:27:13	0:10:19
32	0:20:22	0:21:34	0:21:57	0:19:51	0:21:46	0:21:06	0:00:56
34	0:35:51	0:29:24	0:21:12	0:26:59	0:17:21	0:26:09	0:07:12
35	0:25:39	0:17:50	0:29:29	0:21:25	0:17:52	0:22:27	0:05:05
37	0:36:14	0:26:17	0:29:18	0:51:17	0:27:15	0:34:04	0:10:23
38	0:25:04	0:20:12	0:37:12	0:22:48	0:19:52	0:25:02	0:07:08
40	1:10:01	0:17:17	0:17:27	0:15:17	0:16:31	0:27:19	0:23:53
					GRAND MEAN	0:28:35	0:13:36

Table E6 displays practice session duration data from non-performance major participants.

Table E6

Practice Durations for Non-Performance Major Participants (N = 11) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
3	0:19:36	0:17:32	0:15:25	0:18:31	0:22:37	0:18:44	0:02:40
5	0:31:07	0:35:41	0:39:04	0:36:58	0:34:14	0:35:25	0:02:59
6	1:08:30	0:57:18	0:25:40	0:22:30	1:14:28	0:49:41	0:24:12
8	0:17:40	0:21:26	0:24:48	0:24:12	0:16:16	0:20:52	0:03:49
14	0:45:35	0:42:12	0:28:57	0:33:10	0:34:14	0:36:50	0:06:51
20	0:27:04	0:27:04	0:28:37	0:45:14	0:22:05	0:30:01	0:08:51
23	0:45:42	0:40:05	0:47:57	0:42:13	0:30:30	0:41:17	0:06:45
30	0:15:25	0:15:17	0:15:23	0:15:48	0:15:24	0:15:27	0:00:12
33	0:16:35	0:16:24	0:17:00	0:20:53	0:17:29	0:17:40	0:01:51
36	0:19:10	0:16:38	0:22:44	0:16:54	0:18:24	0:18:46	0:02:27
39	0:16:15	0:16:25	0:14:47	0:11:50	0:17:19	0:15:19	0:02:09
					GRAND MEAN	0:27:17	0:13:50

Table E7 displays practice session duration data from three participants reporting ~~with~~ less than 1 year of voice lessons at the time of the study.

Table E7

Practice Durations for Participants with <1 Year of Voice Lessons (N = 3) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
20	0:27:04	0:27:04	0:28:37	0:45:14	0:22:05	0:30:01	0:07:55
23	0:45:42	0:40:05	0:47:57	0:42:13	0:30:30	0:41:17	0:06:03
36	0:19:10	0:16:38	0:22:44	0:16:54	0:18:24	0:18:46	0:02:12
					GRAND MEAN	0:30:01	0:11:18

Table E8 displays practice session duration data from participants (*N* = 6) reporting 1-2 years of voice lessons at the time of the study.

Table E8

Practice Durations for Participants with 1-2 Years of Voice Lessons (N = 6) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
22	0:19:52	0:21:52	0:27:52	0:16:48	0:28:58	0:23:04	0:05:13
28	0:29:55	0:19:23	0:27:19	0:29:23	0:22:47	0:25:45	0:04:32
30	0:15:25	0:15:17	0:15:23	0:15:48	0:15:24	0:15:27	0:00:12
33	0:16:35	0:16:24	0:17:00	0:20:53	0:17:29	0:17:40	0:01:51
34	0:35:51	0:29:24	0:21:12	0:26:59	0:17:21	0:26:09	0:07:12
39	0:16:15	0:16:25	0:14:47	0:11:50	0:17:19	0:15:19	0:02:09
					GRAND MEAN	0:20:34	0:06:03

Table E9 displays practice session duration data from participants (N = 7) with 3-5 years of voice lessons.

Table E9

Practice Durations for Participants with 3-5 Years of Voice Lessons (N = 7) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
3	0:19:36	0:17:32	0:15:25	0:18:31	0:22:37	0:18:44	0:02:40
7	0:10:03	0:11:01	0:15:05	0:15:00	0:11:08	0:12:27	0:02:24
8	0:17:40	0:21:26	0:24:48	0:24:12	0:16:16	0:20:52	0:03:49
14	0:45:35	0:42:12	0:28:57	0:33:10	0:34:14	0:36:50	0:06:51
25	0:49:13	0:18:10	0:29:59	0:28:37	0:44:00	0:34:00	0:12:31
26	0:26:23	0:26:49	0:27:18	0:25:11	0:29:16	0:26:59	0:01:30
40	1:10:01	0:17:17	0:17:27	0:15:17	0:16:31	0:27:19	0:23:53
					GRAND MEAN	0:25:19	0:12:38

Table E10 displays practice session duration data from participants (*N* = 11) reporting 6-9 years of voice lessons.

Table E10

Practice Durations for Participants with 6-9 Years of Voice Lessons (N = 11) Across Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
2	0:47:25	0:31:42	0:21:27	0:34:11	0:37:12	0:34:23	0:09:23
5	0:31:07	0:35:41	0:39:04	0:36:58	0:34:14	0:35:25	0:02:59
10	0:28:45	0:20:20	0:18:32	0:17:33	0:34:43	0:23:59	0:07:27
11	0:23:53	0:28:03	0:16:53	0:31:58	0:33:15	0:26:48	0:06:39
12	0:22:34	0:37:26	0:34:14	0:48:18	0:23:16	0:33:10	0:10:43
16	0:39:01	0:46:36	1:09:44	0:48:10	0:09:41	0:42:38	0:21:41
17	0:30:25	0:16:04	0:23:37	0:17:15	0:18:02	0:21:05	0:05:58
19	0:35:15	0:19:55	0:36:01	0:17:37	0:30:41	0:27:54	0:08:37
29	1:18:42	0:42:04	0:39:46	0:47:07	0:37:50	0:49:06	0:16:55
31	0:39:06	0:18:09	0:15:27	0:28:14	0:35:08	0:27:13	0:10:19
37	0:36:14	0:26:17	0:29:18	0:51:17	0:27:15	0:34:04	0:10:23
					GRAND MEAN	0:32:20	0:12:53

Table E11 displays practice session duration duration data from participants (*N* = 13) reporting 10 or more years of voice lessons.

Table E11

Practice Durations for Participants with 10+ Years of Voice Lessons Across (N = 13) Five Practice Sessions

Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
1	0:21:38	0:18:57	0:19:57	0:51:28	0:27:53	0:27:59	0:13:35
4	0:19:02	0:50:33	0:52:59	0:15:57	0:19:29	0:31:36	0:18:29
6	1:08:30	0:57:18	0:25:40	0:22:30	1:14:28	0:49:41	0:24:12
9	0:51:59	0:38:29	0:30:01	0:45:52	0:36:33	0:40:35	0:08:31
13	0:05:54	0:17:49	0:13:35	0:16:07	0:13:00	0:13:17	0:04:34
15	0:42:00	0:20:03	0:44:28	0:41:30	0:35:03	0:36:37	0:09:53
18	0:44:23	0:50:36	1:07:44	0:40:50	0:53:19	0:51:22	0:10:24
21	0:22:28	0:21:56	0:17:12	0:35:27	0:34:58	0:26:24	0:08:18
24	0:35:37	0:30:21	0:31:35	0:32:44	0:27:02	0:31:28	0:03:09
27	0:05:17	0:04:48	0:04:48	0:03:56	0:06:30	0:05:04	0:00:56
32	0:20:22	0:21:34	0:21:57	0:19:51	0:21:46	0:21:06	0:00:56
35	0:25:39	0:17:50	0:29:29	0:21:25	0:17:52	0:22:27	0:05:05
38	0:25:04	0:20:12	0:37:12	0:22:48	0:19:52	0:25:02	0:07:08
					GRAND MEAN	0:29:26	0:16:08

Appendix F

RQ 5 Disaggregations: Estimated Practice Session Durations (Research Question Two).

Table F1 displays the differences between estimated session duration and mean session duration data from female participants.

Table F1

Differences Between Female Participants' (N = 21) Estimated an Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
1	0:45:00	1	0:45:00	0:26:00	-0:19:00
2	0:30:00	2	0:15:00	0:34:00	+0:19:00
3	1:00:00	1	1:00:00	0:19:00	-0:41:00
4	0:30:00	1	0:30:00	0:32:00	+0:02:00
6	0:45:00	2	0:23:00	0:50:00	+0:27:00
8	0:30:00	1	0:30:00	0:21:00	-0:09:00
9	1:00:00	2	0:30:00	0:41:00	+0:11:00
10	1:00:00	4	0:15:00	0:24:00	+0:09:00
12	2:00:00	1	2:00:00	0:33:00	-1:27:00
14	1:00:00	1	1:00:00	0:37:00	-0:23:00
15	1:00:00	1	1:00:00	0:37:00	-0:23:00
16	1:00:00	3	0:20:00	0:43:00	+0:23:00
18	1:00:00	1	1:00:00	0:51:00	-0:09:00
21	0:30:00	2	0:15:00	0:26:00	+0:11:00
25	0:30:00	2	0:15:00	0:34:00	+0:19:00
26	1:00:00	2	0:30:00	0:27:00	-0:03:00
27	1:00:00	5	0:12:00	0:05:00	-0:07:00
35	1:00:00	1	1:00:00	0:22:00	-0:38:00
36	1:00:00	1	1:00:00	0:19:00	-0:41:00
37	0:30:00	3	0:10:00	0:34:00	+0:24:00
38	2:00:00	1	2:00:00	0:25:00	-1:35:00
				MEAN	-0:12:00
				SD	0:34:00

Note. P = Participant

Table F2 displays the differences between estimated session duration and mean session duration data from male participants.

Table F2

Differences Between Male Participants' (N = 16) Estimated and Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
5	0:30:00	1	0:30:00	0:35:00	+0:05:00
7	1:00:00	2	0:30:00	0:12:00	-0:18:00
11	0:30:00	1	0:30:00	0:27:00	-0:03:00
17	1:00:00	2	0:30:00	0:21:00	-0:09:00
19	0:30:00	1	0:30:00	0:28:00	-0:02:00
20	0:15:00	2	0:08:00	0:30:00	+0:22:00
22	1:00:00	2	0:30:00	0:23:00	-0:07:00
23	1:00:00	2	0:30:00	0:41:00	+0:11:00
24	1:00:00	2	0:30:00	0:31:00	+0:01:00
28	0:30:00	2	0:15:00	0:26:00	+0:11:00
29	1:30:00	2	0:45:00	0:49:00	+0:04:00
32	1:00:00	2	0:30:00	0:21:00	-0:09:00
33	0:20:00	1	0:20:00	0:18:00	-0:02:00
34	1:00:00	1	1:00:00	0:26:00	-0:34:00
39	0:30:00	1	0:30:00	0:15:00	-0:15:00
40	1:00:00	1	1:00:00	0:27:00	-0:33:00
				MEAN	-0:05:00
				SD	0:15:00

Note. P = Participant

Table F3 shows the differences between estimated session duration and mean session duration data from undergraduate participants.

Table F3

Differences Between Undergraduate Participants' (N = 20) Estimated and Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
1	0:45:00	1	0:45:00	0:26:00	-0:19:00
2	0:30:00	2	0:15:00	0:34:00	+0:19:00
3	1:00:00	1	1:00:00	0:19:00	-0:41:00
5	0:30:00	1	0:30:00	0:35:00	+0:05:00
6	0:45:00	2	0:23:00	0:50:00	+0:27:00
7	1:00:00	2	0:30:00	0:12:00	-0:18:00
8	0:30:00	1	0:30:00	0:21:00	-0:09:00
12	2:00:00	1	2:00:00	0:33:00	-1:27:00
14	1:00:00	1	1:00:00	0:37:00	-0:23:00
15	1:00:00	1	1:00:00	0:37:00	-0:23:00
18	1:00:00	1	1:00:00	0:51:00	-0:09:00
19	0:30:00	1	0:30:00	0:28:00	-0:02:00
20	0:15:00	2	0:08:00	0:30:00	+0:22:00
23	1:00:00	2	0:30:00	0:41:00	+0:11:00
28	0:30:00	2	0:15:00	0:26:00	+0:11:00
33	0:20:00	1	0:20:00	0:18:00	-0:02:00
34	1:00:00	1	1:00:00	0:26:00	-0:34:00
36	1:00:00	1	1:00:00	0:19:00	-0:41:00
39	0:30:00	1	0:30:00	0:15:00	-0:15:00
40	1:00:00	1	1:00:00	0:27:00	-0:33:00
				MEAN	-0:13:00
				SD	0:27:00

Note. P = Participant

Table F4 shows the differences between estimated session duration and mean session duration data from graduate participants.

Table F4

Differences Between Graduate Participants' (N = 17) Estimated and Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
4	0:30:00	1	0:30:00	0:32:00	+0:02:00
9	1:00:00	2	0:30:00	0:41:00	+0:11:00
10	1:00:00	4	0:15:00	0:24:00	+0:09:00
11	0:30:00	1	0:30:00	0:27:00	-0:03:00
16	1:00:00	3	0:20:00	0:43:00	+0:23:00
17	1:00:00	2	0:30:00	0:21:00	-0:09:00
21	0:30:00	2	0:15:00	0:26:00	+0:11:00
22	1:00:00	2	0:30:00	0:23:00	-0:07:00
24	1:00:00	2	0:30:00	0:31:00	+0:01:00
25	0:30:00	2	0:15:00	0:34:00	+0:19:00
26	1:00:00	2	0:30:00	0:27:00	-0:03:00
27	1:00:00	5	0:12:00	0:05:00	-0:07:00
29	1:30:00	2	0:45:00	0:49:00	+0:04:00
32	1:00:00	2	0:30:00	0:21:00	-0:09:00
35	1:00:00	1	1:00:00	0:22:00	-0:38:00
37	0:30:00	3	0:10:00	0:34:00	+0:24:00
38	2:00:00	1	2:00:00	0:25:00	-1:35:00
				MEAN	-0:04:00
				SD	0:28:00

Note. P = Participant

Table F5 shows the differences between estimated session duration and mean session duration data from vocal performance major participants.

Table F5

Differences Between Participants Majoring in Voice Performance's (N = 27) Estimated and Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
1	0:45:00	1	0:45:00	0:26:00	-0:19:00
2	0:30:00	2	0:15:00	0:34:00	+0:19:00
4	0:30:00	1	0:30:00	0:32:00	+0:02:00
7	1:00:00	2	0:30:00	0:12:00	-0:18:00
9	1:00:00	2	0:30:00	0:41:00	+0:11:00
10	1:00:00	4	0:15:00	0:24:00	+0:09:00
11	0:30:00	1	0:30:00	0:27:00	-0:03:00
12	2:00:00	1	2:00:00	0:33:00	-1:27:00
15	1:00:00	1	1:00:00	0:37:00	-0:23:00
16	1:00:00	3	0:20:00	0:43:00	+0:23:00
17	1:00:00	2	0:30:00	0:21:00	-0:09:00
18	1:00:00	1	1:00:00	0:51:00	-0:09:00
19	0:30:00	1	0:30:00	0:28:00	-0:02:00
21	0:30:00	2	0:15:00	0:26:00	+0:11:00
22	1:00:00	2	0:30:00	0:23:00	-0:07:00
24	1:00:00	2	0:30:00	0:31:00	+0:01:00
25	0:30:00	2	0:15:00	0:34:00	+0:19:00
26	1:00:00	2	0:30:00	0:27:00	-0:03:00
27	1:00:00	5	0:12:00	0:05:00	-0:07:00
28	0:30:00	2	0:15:00	0:26:00	+0:11:00
29	1:30:00	2	0:45:00	0:49:00	+0:04:00
32	1:00:00	2	0:30:00	0:21:00	-0:09:00
34	1:00:00	1	1:00:00	0:26:00	-0:34:00
35	1:00:00	1	1:00:00	0:22:00	-0:38:00
37	0:30:00	3	0:10:00	0:34:00	+0:24:00
38	2:00:00	1	2:00:00	0:25:00	-1:35:00
40	1:00:00	1	1:00:00	0:27:00	-0:33:00
				MEAN	-0:10:00
				SD	0:29:00

Note. P = Participant

Table F6 shows the differences between estimated session duration and mean session duration data from non-performance major participants.

Table F6

Differences Between Non-Performance Major Participants' (N = 10) Estimated and Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
3	1:00:00	1	1:00:00	0:19:00	-0:41:00
5	0:30:00	1	0:30:00	0:35:00	+0:05:00
6	0:45:00	2	0:23:00	0:50:00	+0:27:00
8	0:30:00	1	0:30:00	0:21:00	-0:09:00
14	1:00:00	1	1:00:00	0:37:00	-0:23:00
20	0:15:00	2	0:08:00	0:30:00	+0:22:00
23	1:00:00	2	0:30:00	0:41:00	+0:11:00
33	0:20:00	1	0:20:00	0:18:00	-0:02:00
36	1:00:00	1	1:00:00	0:19:00	-0:41:00
39	0:30:00	1	0:30:00	0:15:00	-0:15:00
				MEAN	-0:07:00
				SD	0:24:00

Note. P = Participant

Table F7 presents data from three participants reporting less than 1 year of voice lessons at the time of the study.

Table F7

Differences Between Participants with <1 Year of Voice Lessons' (N = 3) Estimated and Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
20	0:15:00	2	0:08:00	0:30:00	+0:22:00
23	1:00:00	2	0:30:00	0:41:00	+0:11:00
36	1:00:00	1	1:00:00	0:19:00	-0:41:00
				MEAN	-0:03:00
				SD	0:34:00

Note. P = Participant

Table F8 displays data from five participants reporting 1-2 years of voice lessons at the time of the study.

Table F8

Differences Between Participants with 1-2 Years of Voice Lessons' (N = 5) Estimated and Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
22	1:00:00	2	0:30:00	0:23:00	-0:07:00
28	0:30:00	2	0:15:00	0:26:00	+0:11:00
33	0:20:00	1	0:20:00	0:18:00	-0:02:00
34	1:00:00	1	1:00:00	0:26:00	-0:34:00
39	0:30:00	1	0:30:00	0:15:00	-0:15:00
				MEAN	-0:09:00
				SD	0:17:00

Note. P = Participant

Table F9 shows data from participants (*N* = 7) reporting 3-5 years of voice lessons at the time of the study.

Table F9

Differences Between Participants with 3-5 Years of Voice Lessons' (N = 7) Estimated and Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
3	1:00:00	1	1:00:00	0:19:00	-0:41:00
7	1:00:00	2	0:30:00	0:12:00	-0:18:00
8	0:30:00	1	0:30:00	0:21:00	-0:09:00
14	1:00:00	1	1:00:00	0:37:00	-0:23:00
25	0:30:00	2	0:15:00	0:34:00	+0:19:00
26	1:00:00	2	0:30:00	0:27:00	-0:03:00
40	1:00:00	1	1:00:00	0:27:00	-0:33:00
				MEAN	-0:15:00
				SD	0:20:00

Note. P = Participant

Table F10 presents data from participants (N = 10) reporting 6-9 years of voice lessons at the time of the study.

Table F10

Differences Between Participants with 6-9 Years of Voice Lessons' (N = 10) Estimated and Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
2	0:30:00	2	0:15:00	0:34:00	+0:19:00
5	0:30:00	1	0:30:00	0:35:00	+0:05:00
10	1:00:00	4	0:15:00	0:24:00	+0:09:00
11	0:30:00	1	0:30:00	0:27:00	-0:03:00
12	2:00:00	1	2:00:00	0:33:00	-1:27:00
16	1:00:00	3	0:20:00	0:43:00	+0:23:00
17	1:00:00	2	0:30:00	0:21:00	-0:09:00
19	0:30:00	1	0:30:00	0:28:00	-0:02:00
29	1:30:00	2	0:45:00	0:49:00	+0:04:00
37	0:30:00	3	0:10:00	0:34:00	+0:24:00
				MEAN	-0:02:00
				SD	0:32:00

Note. P = Participant

Table F11 displays data from participants (N = 12) reporting 10 or more years of voice lessons at the time of the study.

Table F11

Differences Between Participants with 10+ Years of Voice Lessons' (N = 12) Estimated and Mean Practice Session Durations

P	Estimated Daily Duration	Estimated Sessions Per Day	Estimated Session Duration	Mean Session Duration	Difference
1	0:45:00	1	0:45:00	0:26:00	-0:19:00
4	0:30:00	1	0:30:00	0:32:00	+0:02:00
6	0:45:00	2	0:23:00	0:50:00	+0:27:00
9	1:00:00	2	0:30:00	0:41:00	+0:11:00
15	1:00:00	1	1:00:00	0:37:00	-0:23:00
18	1:00:00	1	1:00:00	0:51:00	-0:09:00
21	0:30:00	2	0:15:00	0:26:00	+0:11:00
24	1:00:00	2	0:30:00	0:31:00	+0:01:00
27	1:00:00	5	0:12:00	0:05:00	-0:07:00
32	1:00:00	2	0:30:00	0:21:00	-0:09:00
35	1:00:00	1	1:00:00	0:22:00	-0:38:00
38	2:00:00	1	2:00:00	0:25:00	-1:35:00
				MEAN	-0:12:00
				SD	0:31:00

Note. P = Participant

Figure F1 shows comparative analyses of estimated vs actual practice time durations according to years of voice lessons reported.

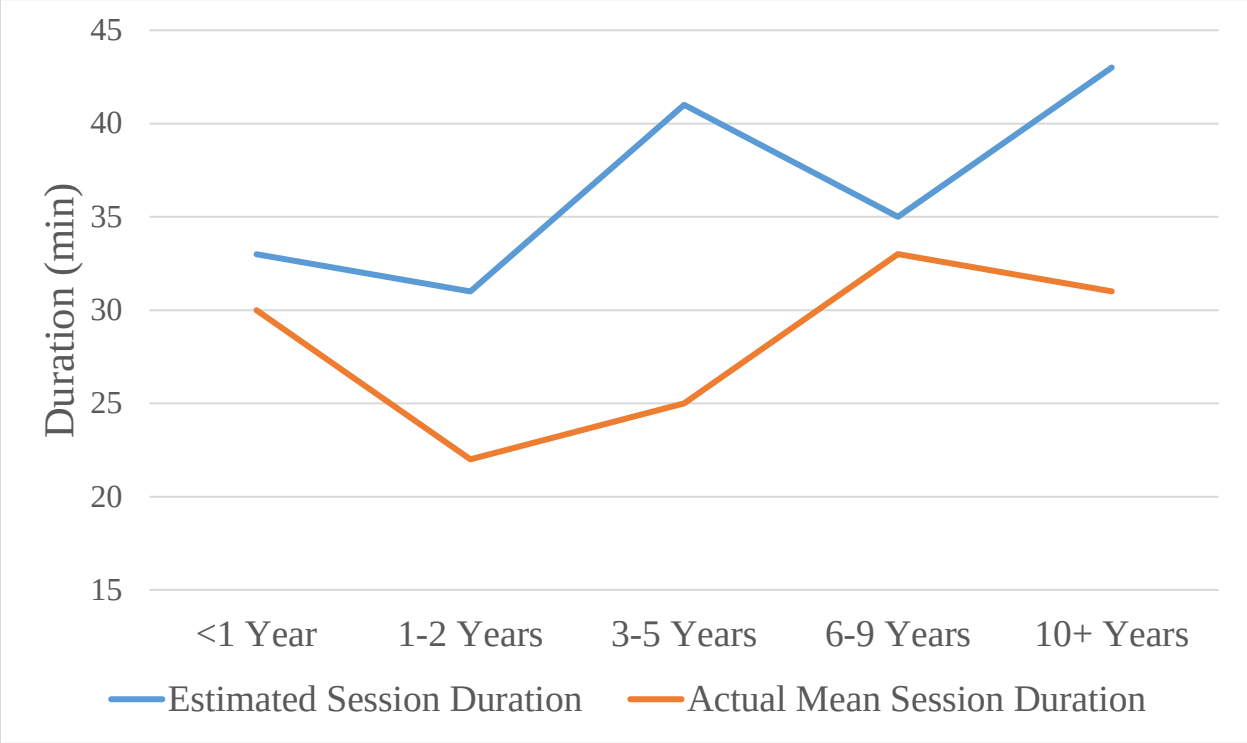

Figure F1. Estimated session duration vs. actual mean session duration of voice lesson subgroups

Appendix G

RQ 5 Disaggregations: Self-reported Practice Frequency and Routine (Research Question Two).

Table G1 shows female participants' estimation of practice frequency and routine.

Table G1

Female Participants' (N = 22) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeric)
1	5	Y	1
2	5	N	0
3	5	N	0
4	6	Y	1
6	5	Y	1
8	3	Y	1
9	5	N	0
10	4	Y	1
12	5	Y	1
14	6	Y	1
15	7	Y	1
16	6	Y	1
18	6	Y	1
21	6	Y	1
25	6	Y	1
26	5	Y	1
27	5	N	0
31	4	N	0
35	5	Y	1
36	4	N	0
37	5	Y	1
38	4	Y	1
Mean	5.09		0.73
SD	0.92		0.46

Table G2 displays male participants' estimated practice frequency and routine.

Table G2

Male Participants' (N = 18) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeric)
5	6	N	0
7	7	Y	1
11	4	Y	1
13	1	N	0
17	6	N	0
19	5	Y	1
20	5	N	0
22	6	Y	1
23	4	Y	1
24	4	Y	1
28	6	Y	1
29	6	N	0
30	7	N	0
32	3	Y	1
33	4	Y	1
34	6	N	0
39	6	N	0
40	3	Y	1
Mean	4.94		0.56
SD	1.59		0.51

Table G3 presents undergraduate participants' estimated practice frequency and routine.

Table G3

Undergraduate Participants' (N = 22) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeral)
1	5	Y	1
2	5	N	0
3	5	N	0
5	6	N	0
6	5	Y	1
7	7	Y	1
8	3	Y	1
12	5	Y	1
14	6	Y	1
15	7	Y	1
18	6	Y	1
19	5	Y	1
20	5	N	0
23	4	Y	1
28	6	Y	1
30	7	N	0
31	4	N	0
33	4	Y	1
34	6	N	0
36	4	N	0
39	6	N	0
40	3	Y	1
Mean	5.18		0.59
SD	1.18		0.50

Table G4 shows graduate participants' estimated practice frequency and routine.

Table G4

Graduate Participants' (N = 18) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeral)
4	6	Y	1
9	5	N	0
10	4	Y	1
11	4	Y	1
13	1	N	0
16	6	Y	1
17	6	N	0
21	6	Y	1
22	6	Y	1
24	4	Y	1
25	6	Y	1
26	5	Y	1
27	5	N	0
29	6	N	0
32	3	Y	1
35	5	Y	1
37	5	Y	1
38	4	Y	1
Mean	4.83		0.72
SD	1.34		0.46

Table G5 displays vocal performance major participants' estimated practice frequency and routine.

Table G5

Vocal Performance Major Participants' (N = 29) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeral)
1	5	Y	1
2	5	N	0
4	6	Y	1
7	7	Y	1
9	5	N	0
10	4	Y	1
11	4	Y	1
12	5	Y	1
13	1	N	0
15	7	Y	1
16	6	Y	1
17	6	N	0
18	6	Y	1
19	5	Y	1
21	6	Y	1
22	6	Y	1
24	4	Y	1
25	6	Y	1
26	5	Y	1
27	5	N	0
28	6	Y	1
29	6	N	0
31	4	N	0
32	3	Y	1
34	6	N	0
35	5	Y	1
37	5	Y	1
38	4	Y	1
40	3	Y	1
Mean	5.03		0.72
SD	1.30		0.45

Table G6 presents non-performance major participants' estimated practice frequency and routine.

Table G6

Non-Performance Major Participants' (N = 11) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeral)
3	5	N	0
5	6	N	0
6	5	Y	1
8	3	Y	1
14	6	Y	1
20	5	N	0
23	4	Y	1
30	7	N	0
33	4	Y	1
36	4	N	0
39	6	N	0
Mean	5.00		0.45
SD	1.18		0.52

Table G7 shows estimated practice frequency and routine for participants reporting less than 1 year of voice lessons.

Table G7

Participants with <1 Year of Voice Lessons' (N = 3) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeral)
20	5	N	0
23	4	Y	1
36	4	N	0
Mean	4.33		0.33
SD	0.58		0.58

Table G8 displays estimated practice frequency and routine for participants reporting 1-2 years of voice lessons.

Table G8

Participants with 1-2 Years of Voice Lessons' (N = 6) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeral)
22	6	Y	1
28	6	Y	1
30	7	N	0
33	4	Y	1
34	6	N	0
39	6	N	0
Mean	5.83		0.50
SD	0.98		0.55

Table G9 presents estimated practice frequency and routine for participants reporting 3-5 years of voice lessons.

Table G9

Participants with 3-5 Years of Voice Lessons' (N = 7) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeral)
3	5	N	0
7	7	Y	1
8	3	Y	1
14	6	Y	1
25	6	Y	1
26	5	Y	1
40	3	Y	1
Mean	5.00		0.86
SD	1.53		0.38

Table G10 shows estimated practice frequency and routine for participants reporting 6-9 years of voice lessons.

Table G10

Participants with 6-9 Years of Voice Lessons' (N = 11) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeral)
2	5	N	0
5	6	N	0
10	4	Y	1
11	4	Y	1
12	5	Y	1
16	6	Y	1
17	6	N	0
19	5	Y	1
29	6	N	0
31	4	N	0
37	5	Y	1
Mean	5.09		0.55
SD	0.83		0.52

Table G11 displays estimated practice frequency and routine for participants reporting 10 or more years of voice lessons.

Table G11

Participants with 10+ Years of Voice Lessons' (N = 13) Estimated Practice Frequency and Routine

Participant	Practice Days Per Week	Routine (Y/N)	Routine (Numeral)
1	5	Y	1
4	6	Y	1
6	5	Y	1
9	5	N	0
13	1	N	0
15	7	Y	1
18	6	Y	1
21	6	Y	1
24	4	Y	1
27	5	N	0
32	3	Y	1
35	5	Y	1
38	4	Y	1
Mean	4.77		0.77
SD	1.54		0.44

Table G12 and Table G13 present descending order results, respectively, for mean frequency of practice days per week and percentage of participants following an established routine.

Table G12

Mean Practice Frequencies per Week in Descending Order According to Years of Reported Voice Lessons

Participant Group	Mean Practice Frequency (Days per Week)
1-2 Years	5.83
6-9 Years	5.09
3-5 Years	5.00
10+ Years	4.77
<1 Year	4.33

Table G13

Percentage of Participants Following Established Practice Routine in Descending Order According to Years of Reported Voice Lessons

Participant Group	Percentage of Participants Following Established Routine
1-2 Years	85.7
10+ Years	76.9
6-9 Years	54.5
3-5 Years	50.0
<1 Year	33.3

Appendix H

RQ 5 Disaggregations: Practice Attitudes and Strategies (Likert-type Responses Items 1-8) (Research Question Two).

Table H1 and Table H2 display Likert-type data from female and male participants respectively.

Table H1

Female Participants' (N = 22) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
1	7	7	2	1	5	6	7	5	5.00	2.33
2	6	4	1	5	7	5	4	1	4.13	2.17
3	3	4	2	2	3	5	5	1	3.13	1.46
4	6	6	1	2	2	3	6	1	3.38	2.26
6	7	6	5	6	6	3	6	5	5.50	1.20
8	2	2	1	4	3	5	4	1	2.75	1.49
9	6	6	4	6	5	2	5	2	4.50	1.69
10	7	6	4	3	6	5	7	5	5.38	1.41
12	4	6	7	3	6	5	6	2	4.88	1.73
14	6	5	1	3	2	4	7	1	3.63	2.26
15	7	7	1	5	3	6	7	2	4.75	2.43
16	6	6	5	5	6	5	7	4	5.50	0.93
18	7	5	3	2	4	5	7	1	4.25	2.19
21	7	6	6	1	3	6	7	3	4.88	2.23
25	6	6	2	3	5	1	7	1	3.88	2.42
26	6	5	1	1	2	6	6	2	3.63	2.33
27	6	6	5	2	6	1	7	5	4.75	2.12
31	4	3	3	2	3	5	7	1	3.50	1.85
35	3	4	1	1	7	3	6	2	3.38	2.20
36	5	6	6	4	3	4	7	1	4.50	1.93
37	6	6	2	5	7	7	7	3	5.38	1.92
38	7	5	1	3	3	6	6	2	4.13	2.17
Mean	5.64	5.32	2.91	3.14	4.41	4.45	6.27	2.32		
SD	1.50	1.25	2.00	1.64	1.76	1.65	0.98	1.52		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Table H2

Male Participants' (N = 18) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
5	6	6	5	3	6	7	7	5	5.63	1.30
7	7	7	7	7	7	7	7	5	6.75	0.71
11	5	4	3	2	5	6	7	3	4.38	1.69
13	2	2	1	1	1	1	1	1	1.25	0.46
17	6	4	4	1	7	2	7	5	4.50	2.20
19	6	6	2	1	3	3	5	2	3.50	1.93
20	5	5	4	5	6	7	7	3	5.25	1.39
22	6	6	2	3	5	2	7	4	4.38	1.92
23	6	4	2	4	5	4	6	1	4.00	1.77
24	4	5	2	2	6	3	6	2	3.75	1.75
28	6	6	3	3	3	7	7	3	4.75	1.91
29	6	5	3	4	2	4	6	3	4.13	1.46
30	6	7	4	2	6	7	7	3	5.25	1.98
32	4	5	3	2	6	6	6	6	4.75	1.58
33	5	4	2	4	5	3	5	6	4.25	1.28
34	6	5	5	4	3	5	7	2	4.63	1.60
39	7	6	4	2	6	6	7	3	5.13	1.89
40	4	4	2	3	3	3	7	2	3.50	1.60
Mean	5.39	5.06	3.22	2.94	4.72	4.61	6.22	3.28		
SD	1.24	1.26	1.48	1.55	1.78	2.06	1.48	1.56		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Table H3 and Table H4 present Likert-type data from undergraduate and graduate participants respectively.

Table H3

Undergraduate Participants' (N = 22) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
1	7	7	2	1	5	6	7	5	5.00	2.33
2	6	4	1	5	7	5	4	1	4.13	2.17
3	3	4	2	2	3	5	5	1	3.13	1.46
5	6	6	5	3	6	7	7	5	5.63	1.30
6	7	6	5	6	6	3	6	5	5.50	1.20
7	7	7	7	7	7	7	7	5	6.75	0.71
8	2	2	1	4	3	5	4	1	2.75	1.49
12	4	6	7	3	6	5	6	2	4.88	1.73
14	6	5	1	3	2	4	7	1	3.63	2.26
15	7	7	1	5	3	6	7	2	4.75	2.43
18	7	5	3	2	4	5	7	1	4.25	2.19
19	6	6	2	1	3	3	5	2	3.50	1.93
20	5	5	4	5	6	7	7	3	5.25	1.39
23	6	4	2	4	5	4	6	1	4.00	1.77
28	6	6	3	3	3	7	7	3	4.75	1.91
30	6	7	4	2	6	7	7	3	5.25	1.98
31	4	3	3	2	3	5	7	1	3.50	1.85
33	5	4	2	4	5	3	5	6	4.25	1.28
34	6	5	5	4	3	5	7	2	4.63	1.60
36	5	6	6	4	3	4	7	1	4.50	1.93
39	7	6	4	2	6	6	7	3	5.13	1.89
40	4	4	2	3	3	3	7	2	3.50	1.60
Mean	5.55	5.23	3.27	3.41	4.45	5.09	6.32	2.55		
SD	1.41	1.38	1.91	1.56	1.60	1.41	1.04	1.65		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Table H4

Graduate Participants' (N = 18) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
4	6	6	1	2	2	3	6	1	3.38	2.26
9	6	6	4	6	5	2	5	2	4.50	1.69
10	7	6	4	3	6	5	7	5	5.38	1.41
11	5	4	3	2	5	6	7	3	4.38	1.69
13	2	2	1	1	1	1	1	1	1.25	0.46
16	6	6	5	5	6	5	7	4	5.50	0.93
17	6	4	4	1	7	2	7	5	4.50	2.20
21	7	6	6	1	3	6	7	3	4.88	2.23
22	6	6	2	3	5	2	7	4	4.38	1.92
24	4	5	2	2	6	3	6	2	3.75	1.75
25	6	6	2	3	5	1	7	1	3.88	2.42
26	6	5	1	1	2	6	6	2	3.63	2.33
27	6	6	5	2	6	1	7	5	4.75	2.12
29	6	5	3	4	2	4	6	3	4.13	1.46
32	4	5	3	2	6	6	6	6	4.75	1.58
35	3	4	1	1	7	3	6	2	3.38	2.20
37	6	6	2	5	7	7	7	3	5.38	1.92
38	7	5	1	3	3	6	6	2	4.13	2.17
Mean	5.50	5.17	2.78	2.61	4.67	3.83	6.17	3.00		
SD	1.38	1.10	1.59	1.54	1.97	2.07	1.42	1.53		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Table H5 and Table H6 show Likert-type data from vocal performance and non-performance major participants respectively.

Table H5

Vocal Performance Major Participants' (N = 29) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
1	7	7	2	1	5	6	7	5	5.00	2.33
2	6	4	1	5	7	5	4	1	4.13	2.17
4	6	6	1	2	2	3	6	1	3.38	2.26
7	7	7	7	7	7	7	7	5	6.75	0.71
9	6	6	4	6	5	2	5	2	4.50	1.69
10	7	6	4	3	6	5	7	5	5.38	1.41
11	5	4	3	2	5	6	7	3	4.38	1.69
12	4	6	7	3	6	5	6	2	4.88	1.73
13	2	2	1	1	1	1	1	1	1.25	0.46
15	7	7	1	5	3	6	7	2	4.75	2.43
16	6	6	5	5	6	5	7	4	5.50	0.93
17	6	4	4	1	7	2	7	5	4.50	2.20
18	7	5	3	2	4	5	7	1	4.25	2.19
19	6	6	2	1	3	3	5	2	3.50	1.93
21	7	6	6	1	3	6	7	3	4.88	2.23
22	6	6	2	3	5	2	7	4	4.38	1.92
24	4	5	2	2	6	3	6	2	3.75	1.75
25	6	6	2	3	5	1	7	1	3.88	2.42
26	6	5	1	1	2	6	6	2	3.63	2.33
27	6	6	5	2	6	1	7	5	4.75	2.12
28	6	6	3	3	3	7	7	3	4.75	1.91
29	6	5	3	4	2	4	6	3	4.13	1.46
31	4	3	3	2	3	5	7	1	3.50	1.85
32	4	5	3	2	6	6	6	6	4.75	1.58
34	6	5	5	4	3	5	7	2	4.63	1.60
35	3	4	1	1	7	3	6	2	3.38	2.20
37	6	6	2	5	7	7	7	3	5.38	1.92
38	7	5	1	3	3	6	6	2	4.13	2.17
40	4	4	2	3	3	3	7	2	3.50	1.60
Mean	5.62	5.28	2.97	2.86	4.52	4.34	6.28	2.76		
SD	1.32	1.19	1.80	1.66	1.84	1.91	1.28	1.50		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Table H6

Non-Performance Major Participants' (N = 11) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
3	3	4	2	2	3	5	5	1	3.13	1.46
5	6	6	5	3	6	7	7	5	5.63	1.30
6	7	6	5	6	6	3	6	5	5.50	1.20
8	2	2	1	4	3	5	4	1	2.75	1.49
14	6	5	1	3	2	4	7	1	3.63	2.26
20	5	5	4	5	6	7	7	3	5.25	1.39
23	6	4	2	4	5	4	6	1	4.00	1.77
30	6	7	4	2	6	7	7	3	5.25	1.98
33	5	4	2	4	5	3	5	6	4.25	1.28
36	5	6	6	4	3	4	7	1	4.50	1.93
39	7	6	4	2	6	6	7	3	5.13	1.89
Mean	5.27	5.00	3.27	3.55	4.64	5.00	6.18	2.73		
SD	1.56	1.41	1.74	1.29	1.57	1.55	1.08	1.90		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Tables H7 – H11 display Likert-type data from participants according to reported years of voice study in ascending order.

Table H7

Participants Reporting <1 Year of Voice Lessons' (N = 3) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
20	5	5	4	5	6	7	7	3	5.25	1.39
23	6	4	2	4	5	4	6	1	4.00	1.77
36	5	6	6	4	3	4	7	1	4.50	1.93
Mean	5.33	5.00	4.00	4.33	4.67	5.00	6.67	1.67		
SD	0.58	1.00	2.00	0.58	1.53	1.73	0.58	1.15		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Table H8

Participants Reporting 1-2 Years of Voice Lessons' (N = 6) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
22	6	6	2	3	5	2	7	4	4.38	1.92
28	6	6	3	3	3	7	7	3	4.75	1.91
30	6	7	4	2	6	7	7	3	5.25	1.98
33	5	4	2	4	5	3	5	6	4.25	1.28
34	6	5	5	4	3	5	7	2	4.63	1.60
39	7	6	4	2	6	6	7	3	5.13	1.89
Mean	6.00	5.67	3.33	3.00	4.67	5.00	6.67	3.50		
SD	0.63	1.03	1.21	0.89	1.37	2.10	0.82	1.38		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Table H9

Participants Reporting 3-5 Years of Voice Lessons' (N = 7) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
3	3	4	2	2	3	5	5	1	3.13	1.46
7	7	7	7	7	7	7	7	5	6.75	0.71
8	2	2	1	4	3	5	4	1	2.75	1.49
14	6	5	1	3	2	4	7	1	3.63	2.26
25	6	6	2	3	5	1	7	1	3.88	2.42
26	6	5	1	1	2	6	6	2	3.63	2.33
40	4	4	2	3	3	3	7	2	3.50	1.60
Mean	4.86	4.71	2.29	3.29	3.57	4.43	6.14	1.86		
SD	1.86	1.60	2.14	1.89	1.81	1.99	1.21	1.46		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Table H10

Participants Reporting 6-9 Years of Voice Lessons' (N = 11) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
2	6	4	1	5	7	5	4	1	4.13	2.17
5	6	6	5	3	6	7	7	5	5.63	1.30
10	7	6	4	3	6	5	7	5	5.38	1.41
11	5	4	3	2	5	6	7	3	4.38	1.69
12	4	6	7	3	6	5	6	2	4.88	1.73
16	6	6	5	5	6	5	7	4	5.50	0.93
17	6	4	4	1	7	2	7	5	4.50	2.20
19	6	6	2	1	3	3	5	2	3.50	1.93
29	6	5	3	4	2	4	6	3	4.13	1.46
31	4	3	3	2	3	5	7	1	3.50	1.85
37	6	6	2	5	7	7	7	3	5.38	1.92
Mean	5.64	5.09	3.55	3.09	5.27	4.91	6.36	3.09		
SD	0.92	1.14	1.69	1.51	1.79	1.51	1.03	1.51		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Table H11

Participants Reporting 10+ Years of Voice Lessons' (N = 13) Likert-Type Responses Regarding Practice Attitudes and Strategies

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Mean	SD
1	7	7	2	1	5	6	7	5	5.00	2.33
4	6	6	1	2	2	3	6	1	3.38	2.26
6	7	6	5	6	6	3	6	5	5.50	1.20
9	6	6	4	6	5	2	5	2	4.50	1.69
13	2	2	1	1	1	1	1	1	1.25	0.46
15	7	7	1	5	3	6	7	2	4.75	2.43
18	7	5	3	2	4	5	7	1	4.25	2.19
21	7	6	6	1	3	6	7	3	4.88	2.23
24	4	5	2	2	6	3	6	2	3.75	1.75
27	6	6	5	2	6	1	7	5	4.75	2.12
32	4	5	3	2	6	6	6	6	4.75	1.58
35	3	4	1	1	7	3	6	2	3.38	2.20
38	7	5	1	3	3	6	6	2	4.13	2.17
Mean	5.62	5.38	2.69	2.62	4.38	3.92	5.92	2.85		
SD	1.76	1.33	1.80	1.85	1.85	1.98	1.61	1.77		

Note. Q1. I like practicing voice; Q2. I find it easy to focus on the task at hand when I practice voice; Q3. I regularly record myself practicing voice and listen to the recordings; Q4. I make a list of what I have to practice voice; Q5. I set targets to achieve in each vocal practice session; Q6. My voice teacher advises me about how to practice voice; Q7. I use my voice teacher's advice when practicing voice; Q8. I look to books and other written resources for musical and pedagogical information that helps me practice voice more effectively.

Appendix I

RQ 5 Disaggregations: Practice Attitudes and Strategies (Multiple Choice) (Research Question Two).

Table I1 displays multiple choice data from female participants.

Table I1

Female Participants' (N = 22) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
1	Non-vocal warm-up exercise	Playing the vocal part on piano
2	Vocal warm-up exercise	Listening to a recording of the piece
3	Vocal warm-up exercise	Playing the vocal part on piano
4	Vocal warm-up exercise	Listening to a recording of the piece
6	Vocal warm-up exercise	Listening to a recording of the piece
8	Vocal warm-up exercise	Listening to a recording of the piece
9	Technical exercises or scales	Playing the vocal part on piano
10	Technical exercises or scales	Speaking the text
12	Vocal warm-up exercise	Listening to a recording of the piece
14	Vocal warm-up exercise	Playing the vocal part on piano
15	Vocal warm-up exercise	Listening to a recording of the piece
16	Vocal warm-up exercise	Speaking the text
18	Vocal warm-up exercise	Listening to a recording of the piece
21	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
25	Vocal warm-up exercise	Breaking piece down into smaller chunks and learning those one at a time.

Table I1, continued

26	Vocal warm-up exercise	Speaking the text
27	Technical exercises or scales	Practicing small sections of the piece that look more difficult than the majority of the piece
31	Non-vocal warm-up exercise	Listening to a recording of the piece
35	Vocal warm-up exercise	Playing the vocal part on piano
36	Vocal warm-up exercise	Listening to a recording of the piece
37	Non-vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
38	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing

Note. P = Participant

Table I2 displays multiple choice data from male participants.

Table I2

Male Participants' (N = 18) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
5	Technical exercises or scales	Listening to a recording of the piece
7	Vocal warm-up exercise	Listening to a recording of the piece
11	Vocal warm-up exercise	Listening to a recording of the piece
13	Non-vocal warm-up exercise	Listening to a recording of the piece
17	Vocal warm-up exercise	Playing the vocal part on piano
19	Technical exercises or scales	Playing the vocal part on piano
20	Vocal warm-up exercise	Playing the vocal part on piano
22	Technical exercises or scales	Working things out just by looking at the music and not singing or playing
23	Vocal warm-up exercise	Listening to a recording of the piece
24	Vocal warm-up exercise	Speaking the text
28	Vocal warm-up exercise	Listening to a recording of the piece
29	Vocal warm-up exercise	Singing the piece from beginning to end without stopping
30	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
32	Vocal warm-up exercise	Writing IPA/Translations of text on a score and learning the text first
33	Vocal warm-up exercise	Listening to a recording of the piece
34	Vocal warm-up exercise	Playing the vocal part on piano
39	Vocal warm-up exercise	Listening to a recording of the piece
40	Vocal warm-up exercise	Listening to a recording of the piece

Note. P = Participant

Table I3 displays multiple choice data from undergraduate participants.

Table I3

Undergraduate Participants' (N = 22) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
1	Non-vocal warm-up exercise	Playing the vocal part on piano
2	Vocal warm-up exercise	Listening to a recording of the piece
3	Vocal warm-up exercise	Playing the vocal part on piano
5	Technical exercises or scales	Listening to a recording of the piece
6	Vocal warm-up exercise	Listening to a recording of the piece
7	Vocal warm-up exercise	Listening to a recording of the piece
8	Vocal warm-up exercise	Listening to a recording of the piece
12	Vocal warm-up exercise	Listening to a recording of the piece
14	Vocal warm-up exercise	Playing the vocal part on piano
15	Vocal warm-up exercise	Listening to a recording of the piece
18	Vocal warm-up exercise	Listening to a recording of the piece
19	Technical exercises or scales	Playing the vocal part on piano
20	Vocal warm-up exercise	Playing the vocal part on piano
23	Vocal warm-up exercise	Listening to a recording of the piece
28	Vocal warm-up exercise	Listening to a recording of the piece
30	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
31	Non-vocal warm-up exercise	Listening to a recording of the piece
33	Vocal warm-up exercise	Listening to a recording of the piece

Table I3, continued

34	Vocal warm-up exercise	Playing the vocal part on piano
36	Vocal warm-up exercise	Listening to a recording of the piece
39	Vocal warm-up exercise	Listening to a recording of the piece
40	Vocal warm-up exercise	Listening to a recording of the piece

Note. P = Participant

Table I4 displays multiple choice data from graduate participants.

Table I4

Graduate Participants' (N = 18) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
4	Vocal warm-up exercise	Listening to a recording of the piece
9	Technical exercises or scales	Playing the vocal part on piano
10	Technical exercises or scales	Speaking the text
11	Vocal warm-up exercise	Listening to a recording of the piece
13	Non-vocal warm-up exercise	Listening to a recording of the piece
16	Vocal warm-up exercise	Speaking the text
17	Vocal warm-up exercise	Playing the vocal part on piano
21	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
22	Technical exercises or scales	Working things out just by looking at the music and not singing or playing
24	Vocal warm-up exercise	Speaking the text
25	Vocal warm-up exercise	Breaking piece down into smaller chunks and learning those one at a time.
26	Vocal warm-up exercise	Speaking the text
27	Technical exercises or scales	Practicing small sections of the piece that look more difficult than the majority of the piece
29	Vocal warm-up exercise	Singing the piece from beginning to end without stopping
32	Vocal warm-up exercise	Writing IPA/Translations of text on a score and learning the text first
35	Vocal warm-up exercise	Playing the vocal part on piano
37	Non-vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
38	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing

Note. P = Participant

Table I5 displays multiple choice data from vocal performance majors.

Table I5

Vocal Performance Majors' (N = 29) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
1	Non-vocal warm-up exercise	Playing the vocal part on piano
2	Vocal warm-up exercise	Listening to a recording of the piece
4	Vocal warm-up exercise	Listening to a recording of the piece
7	Vocal warm-up exercise	Listening to a recording of the piece
9	Technical exercises or scales	Playing the vocal part on piano
10	Technical exercises or scales	Speaking the text
11	Vocal warm-up exercise	Listening to a recording of the piece
12	Vocal warm-up exercise	Listening to a recording of the piece
13	Non-vocal warm-up exercise	Listening to a recording of the piece
15	Vocal warm-up exercise	Listening to a recording of the piece
16	Vocal warm-up exercise	Speaking the text
17	Vocal warm-up exercise	Playing the vocal part on piano
18	Vocal warm-up exercise	Listening to a recording of the piece
19	Technical exercises or scales	Playing the vocal part on piano
21	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
22	Technical exercises or scales	Working things out just by looking at the music and not singing or playing
24	Vocal warm-up exercise	Speaking the text
25	Vocal warm-up exercise	Breaking piece down into smaller chunks and learning those one at a time.

Table I5, continued

26	Vocal warm-up exercise	Speaking the text
27	Technical exercises or scales	Practicing small sections of the piece that look more difficult than the majority of the piece
28	Vocal warm-up exercise	Listening to a recording of the piece
29	Vocal warm-up exercise	Singing the piece from beginning to end without stopping
31	Non-vocal warm-up exercise	Listening to a recording of the piece
32	Vocal warm-up exercise	Writing IPA/Translations of text on a score and learning the text first
34	Vocal warm-up exercise	Playing the vocal part on piano
35	Vocal warm-up exercise	Playing the vocal part on piano
37	Non-vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
38	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
40	Vocal warm-up exercise	Listening to a recording of the piece

Note. P = Participant

Table I6 displays multiple choice data from non-performance majors.

Table I6

Non-Performance Majors' (N = 11) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
3	Vocal warm-up exercise	Playing the vocal part on piano
5	Technical exercises or scales	Listening to a recording of the piece
6	Vocal warm-up exercise	Listening to a recording of the piece
8	Vocal warm-up exercise	Listening to a recording of the piece
14	Vocal warm-up exercise	Playing the vocal part on piano
20	Vocal warm-up exercise	Playing the vocal part on piano
23	Vocal warm-up exercise	Listening to a recording of the piece
30	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
33	Vocal warm-up exercise	Listening to a recording of the piece
36	Vocal warm-up exercise	Listening to a recording of the piece
39	Vocal warm-up exercise	Listening to a recording of the piece

Note. P = Participant

Tables I7 – I11 display multiple choice data from participants according to reported years of voice study in ascending order.

Table I7

Participants Reporting <1 Year of Voice Lessons' (N = 3) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
20	Vocal warm-up exercise	Playing the vocal part on piano
23	Vocal warm-up exercise	Listening to a recording of the piece
36	Vocal warm-up exercise	Listening to a recording of the piece

Note. P = Participant

Table I8

Participants Reporting 1-2 Years of Voice Lessons' (N = 6) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
22	Technical exercises or scales	Working things out just by looking at the music and not singing or playing
28	Vocal warm-up exercise	Listening to a recording of the piece
30	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
33	Vocal warm-up exercise	Listening to a recording of the piece
34	Vocal warm-up exercise	Playing the vocal part on piano
39	Vocal warm-up exercise	Listening to a recording of the piece

Note. P = Participant

Table I9

Participants Reporting 3-5 Years of Voice Lessons' (N = 7) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
3	Vocal warm-up exercise	Playing the vocal part on piano
7	Vocal warm-up exercise	Listening to a recording of the piece
8	Vocal warm-up exercise	Listening to a recording of the piece
14	Vocal warm-up exercise	Playing the vocal part on piano
25	Vocal warm-up exercise	Breaking piece down into smaller chunks and learning those one at a time.
26	Vocal warm-up exercise	Speaking the text
40	Vocal warm-up exercise	Listening to a recording of the piece

Note. P = Participant

Table I10

Participants Reporting 6-9 Years of Voice Lessons' (N = 11) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
2	Vocal warm-up exercise	Listening to a recording of the piece
5	Technical exercises or scales	Listening to a recording of the piece
10	Technical exercises or scales	Speaking the text
11	Vocal warm-up exercise	Listening to a recording of the piece
12	Vocal warm-up exercise	Listening to a recording of the piece
16	Vocal warm-up exercise	Speaking the text
17	Vocal warm-up exercise	Playing the vocal part on piano
19	Technical exercises or scales	Playing the vocal part on piano
29	Vocal warm-up exercise	Singing the piece from beginning to end without stopping
31	Non-vocal warm-up exercise	Listening to a recording of the piece
37	Non-vocal warm-up exercise	Working things out just by looking at the music and not singing or playing

Note. P = Participant

Table I11

Participants Reporting 10+ Years of Voice Lessons' (N = 13) Multiple Choice Responses Regarding Practice Attitudes and Strategies

P	Most of the time I prefer to start my vocal practice sessions with:	When learning new vocal repertoire, most of the time I prefer to start by:
1	Non-vocal warm-up exercise	Playing the vocal part on piano
4	Vocal warm-up exercise	Listening to a recording of the piece
6	Vocal warm-up exercise	Listening to a recording of the piece
9	Technical exercises or scales	Playing the vocal part on piano
13	Non-vocal warm-up exercise	Listening to a recording of the piece
15	Vocal warm-up exercise	Listening to a recording of the piece
18	Vocal warm-up exercise	Listening to a recording of the piece
21	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing
24	Vocal warm-up exercise	Speaking the text
27	Technical exercises or scales	Practicing small sections of the piece that look more difficult than the majority of the piece
32	Vocal warm-up exercise	Writing IPA/Translations of text on a score and learning the text first
35	Vocal warm-up exercise	Playing the vocal part on piano
38	Vocal warm-up exercise	Working things out just by looking at the music and not singing or playing

Note. P = Participant

Appendix J

RQ 5 Disaggregations: Likert-type Responses from Session Questionnaires (Research Question Two).

Table J1 displays a summary of practice session efficiency ratings from female participants.

Table J1

Summary of Female Participant's (N = 22) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
1	3	2	3	2	3	2.60	0.55
2	2	2	3	3	2	2.40	0.55
3	3	3	2	3	2	2.60	0.55
4	1	3	2	1	2	1.80	0.84
6	5	2	2	4	2	3.00	1.41
8	3	6	3	2	3	3.40	1.52
9	2	3	3	2	3	2.60	0.55
10	3	2	4	4	1	2.80	1.30
12	5	3	3	2	5	3.60	1.34
14	2	1	3	3	3	2.40	0.89
15	2	3	1	2	2	2.00	0.71
16	3	3	2	2	3	2.60	0.55
18	2	1	1	3	2	1.80	0.84
21	3	3	5	4	4	3.80	0.84
25	2	2	4	2	4	2.80	1.10
26	4	4	4	4	4	4.00	0.00
27	4	4	4	4	4	4.00	0.00
31	3	3	2	2	3	2.60	0.55
35	5	1	2	2	1	2.20	1.64
36	4	3	2	2	2	2.60	0.89
37	3	2	4	2	3	2.80	0.84
38	4	4	4	4	2	4.00	0.00
					GRAND MEAN	2.84	0.79
					MODE	2	

Table J2 displays a summary of practice session efficiency ratings from male participants.

Table J2

Summary of Male Participant's (N = 18) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
5	2	2	3	5	2	2.80	1.30
7	2	2	1	1	2	1.60	0.55
11	3	3	3	3	2	2.80	0.45
13	3	3	3	3	3	3.00	0.00
17	2	3	5	4	4	3.60	1.14
19	2	2	2	4	3	2.60	0.89
20	3	3	3	2	3	2.80	0.45
22	2	3	2	3	2	2.40	0.55
23	4	3	3	4	5	3.80	0.84
24	3	2	2	2	2	2.20	0.45
28	3	5	3	2	5	3.60	1.34
29	3	3	2	2	2	2.40	0.55
30	3	3	3	2	3	2.80	0.45
32	3	3	2	7	6	4.20	2.17
33	3	3	5	5	2	3.60	1.34
34	2	3	3	3	4	3.00	0.71
39	3	3	3	3	3	3.00	0.00
40	4	4	4	4	4	4.00	0.00
					GRAND MEAN	3.01	0.73
					MODE	3	

Table J3 displays a summary of practice session efficiency ratings from undergraduate participants.

Table J3

Summary of Undergraduate Participant's (N = 22) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
1	3	2	3	2	3	2.60	0.55
2	2	2	3	3	2	2.40	0.55
3	3	3	2	3	2	2.60	0.55
5	2	2	3	5	2	2.80	1.30
6	5	2	2	4	2	3.00	1.41
7	2	2	1	1	2	1.60	0.55
8	3	6	3	2	3	3.40	1.52
12	5	3	3	2	5	3.60	1.34
14	2	1	3	3	3	2.40	0.89
15	2	3	1	2	2	2.00	0.71
18	2	1	1	3	2	1.80	0.84
19	2	2	2	4	3	2.60	0.89
20	3	3	3	2	3	2.80	0.45
23	4	3	3	4	5	3.80	0.84
28	3	5	3	2	5	3.60	1.34
30	3	3	3	2	3	2.80	0.45
31	3	3	2	2	3	2.60	0.55
33	3	3	5	5	2	3.60	1.34
34	2	3	3	3	4	3.00	0.71
36	4	3	2	2	2	2.60	0.89
39	3	3	3	3	3	3.00	0.00
40	4	4	4	4	4	4.00	0.00
					GRAND MEAN	2.85	0.80
					MODE	3	

Table J4 displays a summary of practice session efficiency ratings from graduate participants.

Table J4

Summary of Graduate Participant's (N = 18) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
4	1	3	2	1	2	1.80	0.84
9	2	3	3	2	3	2.60	0.55
10	3	2	4	4	1	2.80	1.30
11	3	3	3	3	2	2.80	0.45
13	3	3	3	3	3	3.00	0.00
16	3	3	2	2	3	2.60	0.55
17	2	3	5	4	4	3.60	1.14
21	3	3	5	4	4	3.80	0.84
22	2	3	2	3	2	2.40	0.55
24	3	2	2	2	2	2.20	0.45
25	2	2	4	2	4	2.80	1.10
26	4	4	4	4	4	4.00	0.00
27	4	4	4	4	4	4.00	0.00
29	3	3	2	2	2	2.40	0.55
32	3	3	2	7	6	4.20	2.17
35	5	1	2	2	1	2.20	1.64
37	3	2	4	2	3	2.80	0.84
38	4	4	4	4	4	4.00	0.00
					GRAND MEAN	3.00	0.72
					MODE	3	

Table J5 displays a summary of practice session efficiency ratings from vocal performance majors.

Table J5

Summary of Vocal Performance Major's (N = 29) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
1	3	2	3	2	3	2.60	0.55
2	2	2	3	3	2	2.40	0.55
4	1	3	2	1	2	1.80	0.84
7	2	2	1	1	2	1.60	0.55
9	2	3	3	2	3	2.60	0.55
10	3	2	4	4	1	2.80	1.30
11	3	3	3	3	2	2.80	0.45
12	5	3	3	2	5	3.60	1.34
13	3	3	3	3	3	3.00	0.00
15	2	3	1	2	2	2.00	0.71
16	3	3	2	2	3	2.60	0.55
17	2	3	5	4	4	3.60	1.14
18	2	1	1	3	2	1.80	0.84
19	2	2	2	4	3	2.60	0.89
21	3	3	5	4	4	3.80	0.84
22	2	3	2	3	2	2.40	0.55
24	3	2	2	2	2	2.20	0.45
25	2	2	4	2	4	2.80	1.10
26	4	4	4	4	4	4.00	0.00
27	4	4	4	4	4	4.00	0.00
28	3	5	3	2	5	3.60	1.34
29	3	3	2	2	2	2.40	0.55
31	3	3	2	2	3	2.60	0.55
32	3	3	2	7	6	4.20	2.17
34	2	3	3	3	4	3.00	0.71
35	5	1	2	2	1	2.20	1.64
37	3	2	4	2	3	2.80	0.84
38	4	4	4	4	4	4.00	0.00
40	4	4	4	4	4	4.00	0.00
					GRAND MEAN	2.89	0.72
					MODE	2	

Table J6 displays a summary of practice session efficiency ratings from non-performance majors.

Table J6

Summary of Non-Performance Major's (N = 11) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
3	3	3	2	3	2	2.60	0.55
5	2	2	3	5	2	2.80	1.30
6	5	2	2	4	2	3.00	1.41
8	3	6	3	2	3	3.40	1.52
14	2	1	3	3	3	2.40	0.89
20	3	3	3	2	3	2.80	0.45
23	4	3	3	4	5	3.80	0.84
30	3	3	3	2	3	2.80	0.45
33	3	3	5	5	2	3.60	1.34
36	4	3	2	2	2	2.60	0.89
39	3	3	3	3	3	3.00	0.00
					GRAND MEAN	2.98	0.88
					MODE	3	

Table J7 displays a summary of practice session efficiency ratings from participants reporting less than 1 year of voice lessons.

Table J7

Summary of Participants with <1 Year of Voice Lessons' (N = 3) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
20	3	3	3	2	3	2.80	0.45
23	4	3	3	4	5	3.80	0.84
36	4	3	2	2	2	2.60	0.89
					GRAND MEAN	3.07	0.79
					MODE	3	

Table J8 displays a summary of practice session efficiency ratings from participants reporting 1-2 years of voice lessons.

Table J8

Summary of Participants with 1-2 Years of Voice Lessons' (N = 6) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
22	2	3	2	3	2	2.40	0.55
28	3	5	3	2	5	3.60	1.34
30	3	3	3	2	3	2.80	0.45
33	3	3	5	5	2	3.60	1.34
34	2	3	3	3	4	3.00	0.71
39	3	3	3	3	3	3.00	0.00
					GRAND MEAN	3.07	0.73
					MODE	3	

Table J9 displays a summary of practice session efficiency ratings from participants reporting 3-5 years of voice lessons.

Table J9

Summary of Participants with 3-5 Years of Voice Lessons' (N = 7) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
3	3	3	2	3	2	2.60	0.55
7	2	2	1	1	2	1.60	0.55
8	3	6	3	2	3	3.40	1.52
14	2	1	3	3	3	2.40	0.89
25	2	2	4	2	4	2.80	1.10
26	4	4	4	4	4	4.00	0.00
40	4	4	4	4	4	4.00	0.00
					GRAND MEAN	2.97	0.66
					MODE	4	

Table J10 displays a summary of practice session efficiency ratings from participants reporting 6-9 years of voice lessons.

Table J10

Summary of Participants with 6-9 Years of Voice Lessons' (N = 11) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
2	2	2	3	3	2	2.40	0.55
5	2	2	3	5	2	2.80	1.30
10	3	2	4	4	1	2.80	1.30
11	3	3	3	3	2	2.80	0.45
12	5	3	3	2	5	3.60	1.34
16	3	3	2	2	3	2.60	0.55
17	2	3	5	4	4	3.60	1.14
19	2	2	2	4	3	2.60	0.89
29	3	3	2	2	2	2.40	0.55
31	3	3	2	2	3	2.60	0.55
37	3	2	4	2	3	2.80	0.84
					GRAND MEAN	2.82	0.86
					MODE	2	

Table J11 displays a summary of practice session efficiency ratings from participants reporting 10 or more years of voice lessons.

Table J11

Summary of Participants with 10+ Years of Voice Lessons' (N = 13) Practice Session Efficiency Ratings

	Practice Session Efficiency Ratings						
Participant	Session 1	Session 2	Session 3	Session 4	Session 5	Mean	SD
1	3	2	3	2	3	2.60	0.55
4	1	3	2	1	2	1.80	0.84
6	5	2	2	4	2	3.00	1.41
9	2	3	3	2	3	2.60	0.55
13	3	3	3	3	3	3.00	0.00
15	2	3	1	2	2	2.00	0.71
18	2	1	1	3	2	1.80	0.84
21	3	3	5	4	4	3.80	0.84
24	3	2	2	2	2	2.20	0.45
27	4	4	4	4	4	4.00	0.00
32	3	3	2	7	6	4.20	2.17
35	5	1	2	2	1	2.20	1.64
38	4	4	4	4	4	4.00	0.00
					GRAND MEAN	2.86	0.77
					MODE	2	

Appendix K

RQ 5 Disaggregations: Aggregate Practice Behaviors by Participants Across All Five Practice Sessions (Research Question Three).

Figure K1 displays the percentage of time spent on each category of behaviors by female participants (N = 22) across all practice sessions.

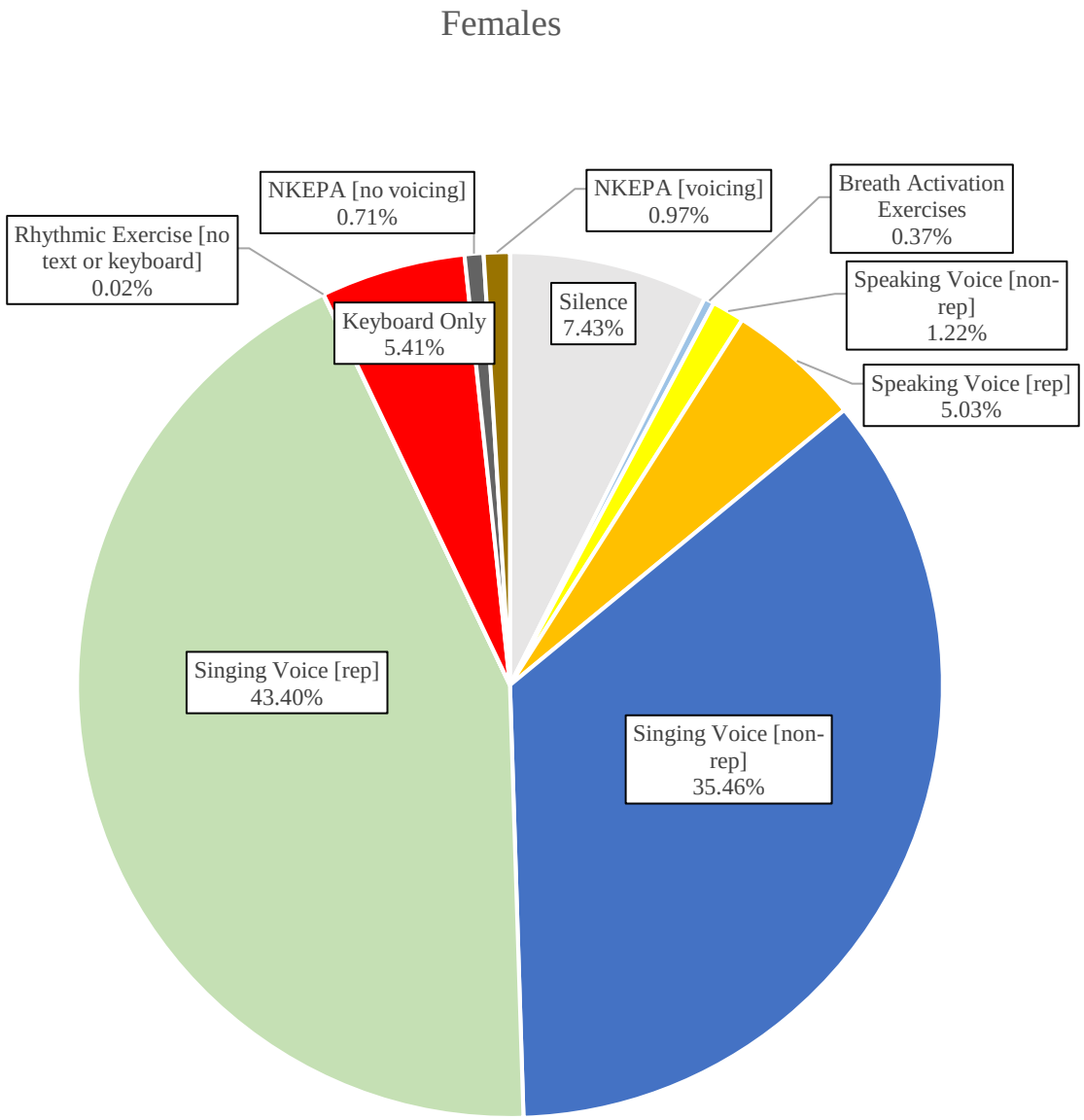

Figure K1. Aggregated mean percentages of time spent during the first 15 minutes across female participants' (N = 22) practice sessions

Figure K2 shows the percentage of time spent on each category of behaviors by male participants (*N* = 18) across all practice sessions.

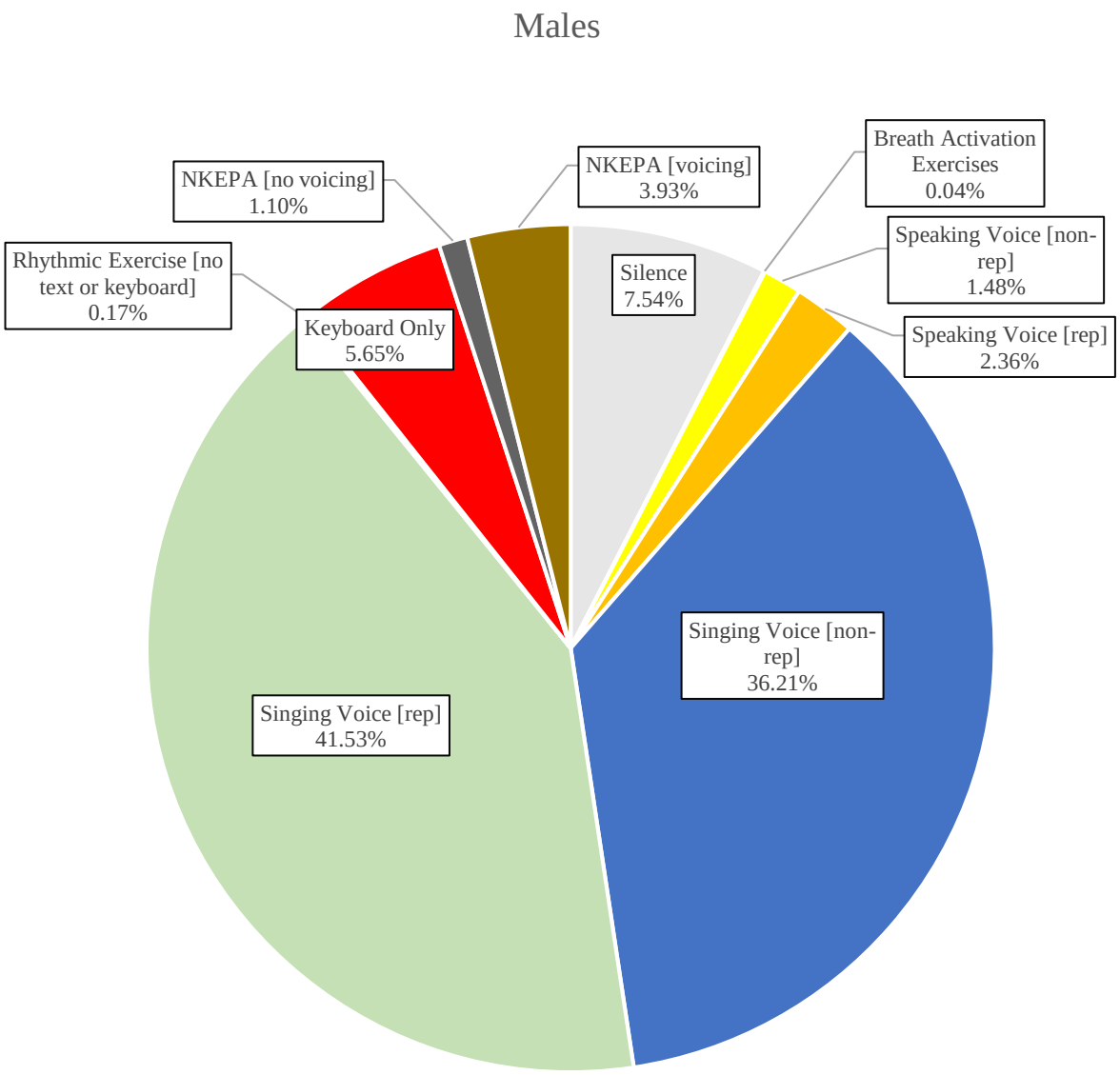

Figure K2. Aggregated mean percentages of time spent during the first 15 minutes across male participants' (*N* = 18) practice sessions

Figure K3 presents the percentage of time spent on each category of behaviors by undergraduate students (*N* = 22) across all practice sessions.

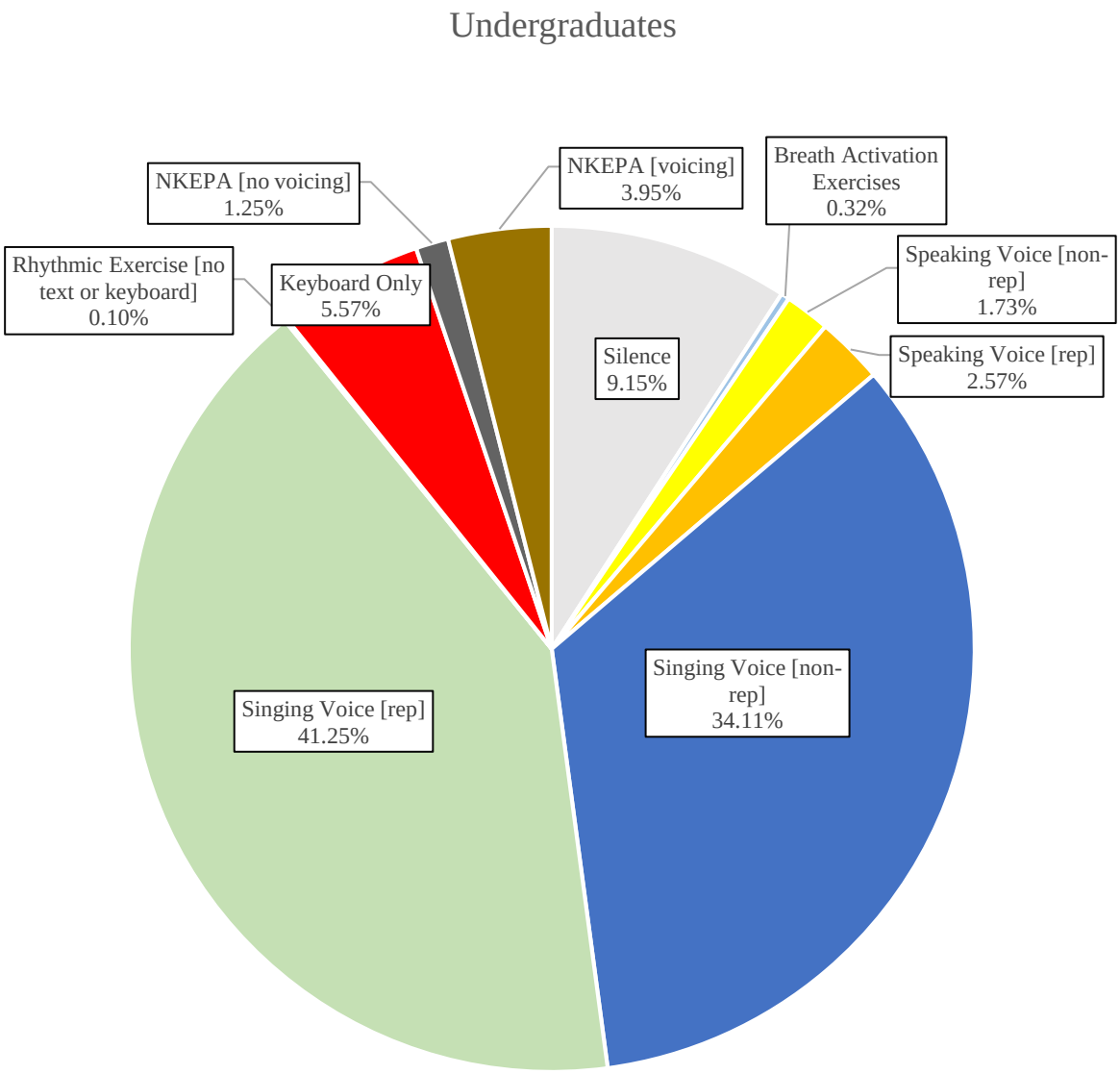

Figure K3. Aggregated mean percentages of time spent during the first 15 minutes across undergraduate participants' (*N* = 22) practice sessions

Figure K4 displays the percentage of time spent on each category of behaviors by graduate participants (*N* = 18) across all practice sessions.

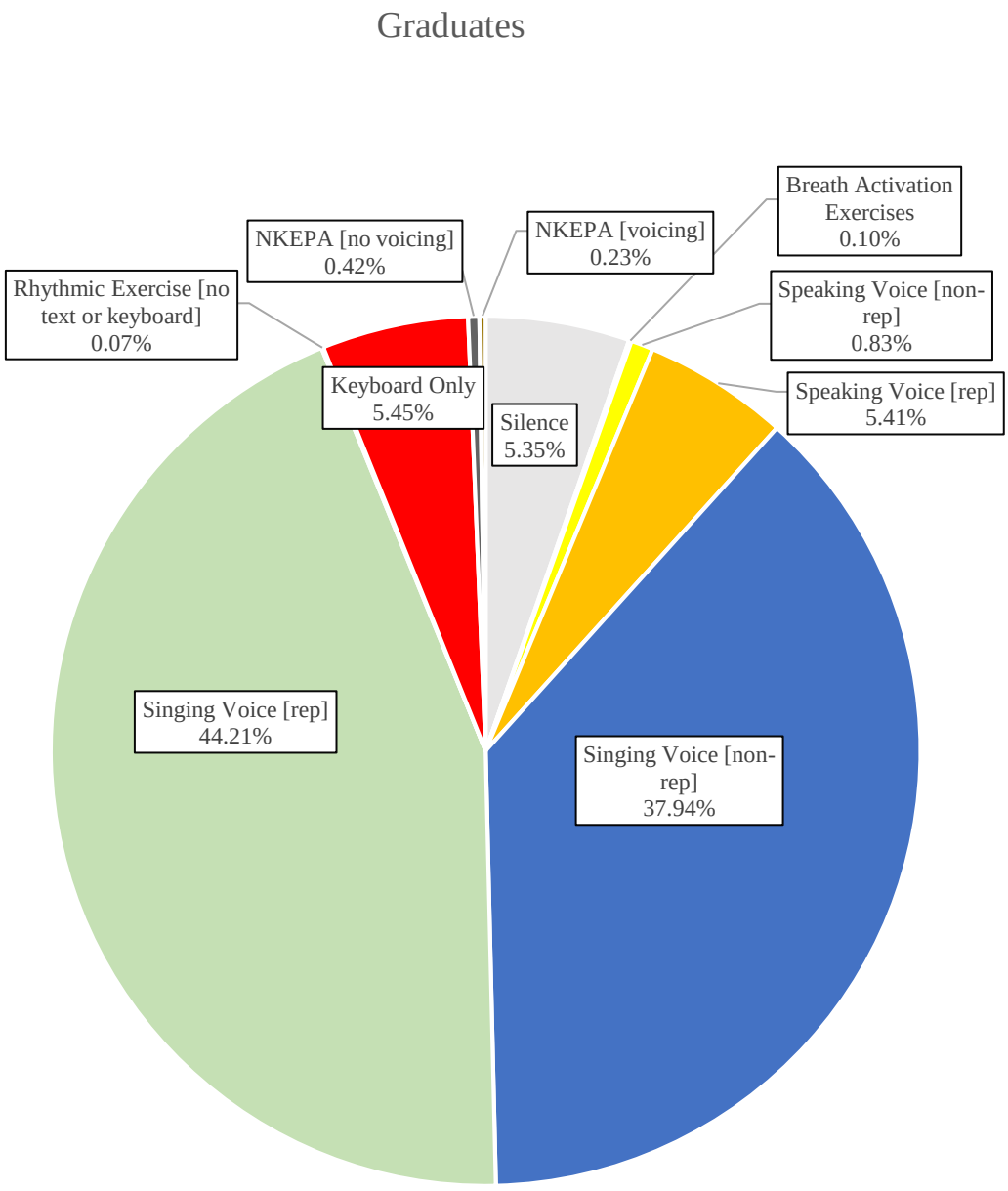

Figure K4. Aggregated mean percentages of time spent during the first 15 minutes across graduate participants' (*N* = 18) practice sessions

Figure K5 shows the percentage of time spent on each category of behaviors by vocal performance majors (*N* = 29) across all practice sessions.

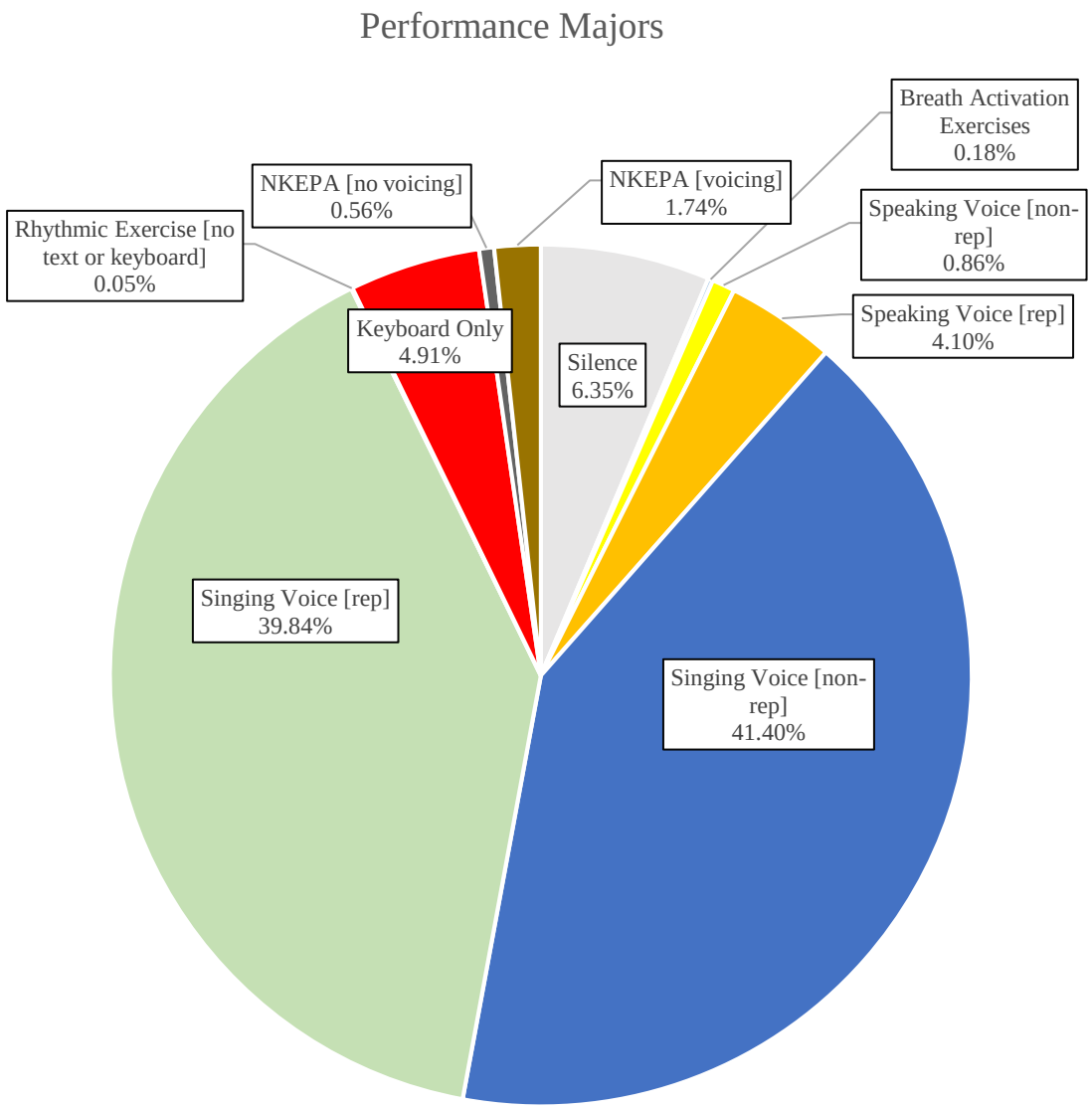

Figure K5. Aggregated mean percentages of time spent during the first 15 minutes across vocal performance majors' (*N* = 29) practice sessions

Figure K6 presents the percentage of time spent on each category of behaviors by non-performance majors (N = 11) across all practice sessions.

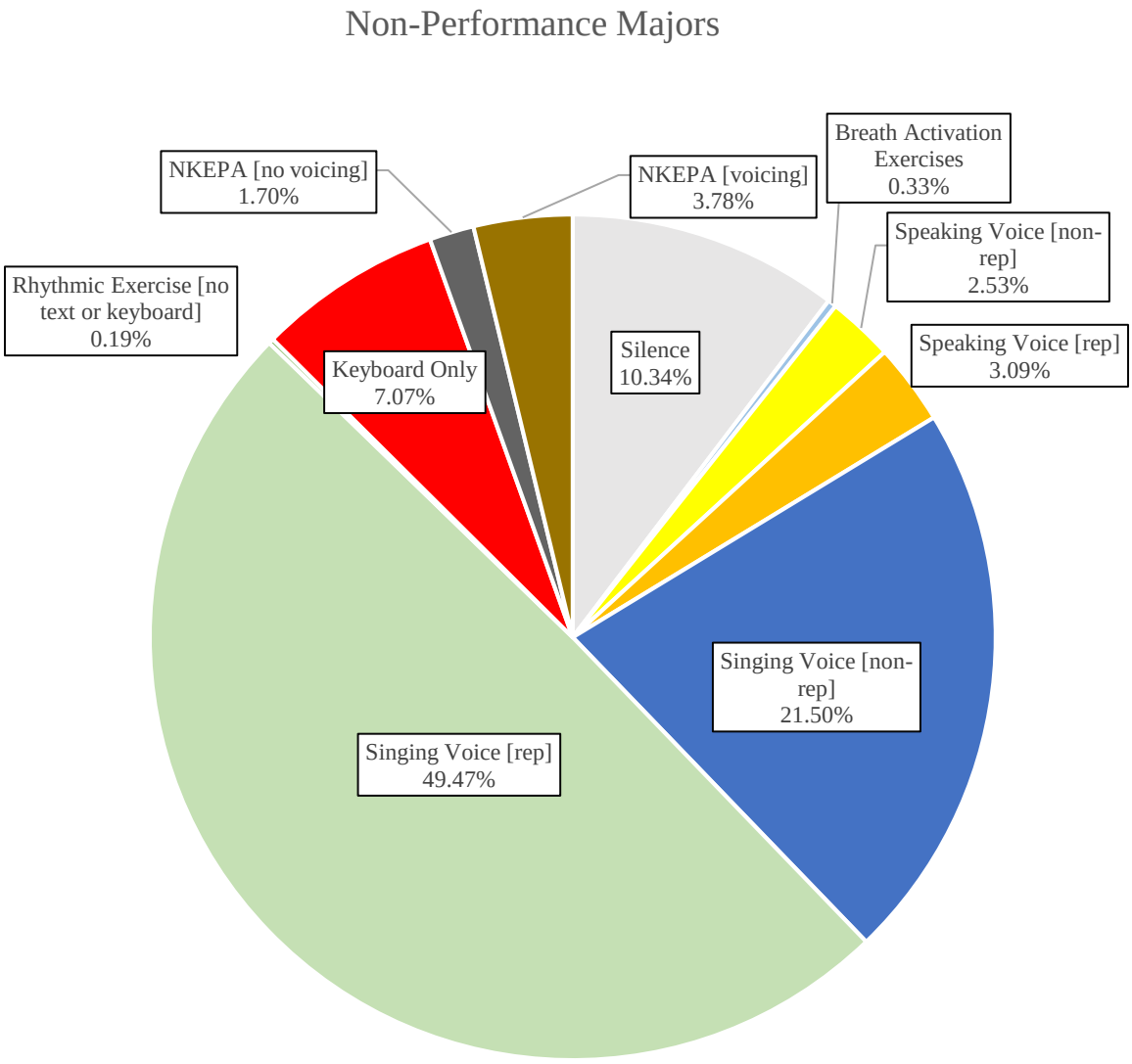

Figure K6. Aggregated mean percentages of time spent during the first 15 minutes across non-performance majors' (N = 11) practice sessions

Figure K7 displays the percentage of time spent on each category of behaviors across all practice sessions by participants who reported less than 1 year of voice lessons (*N* = 3).

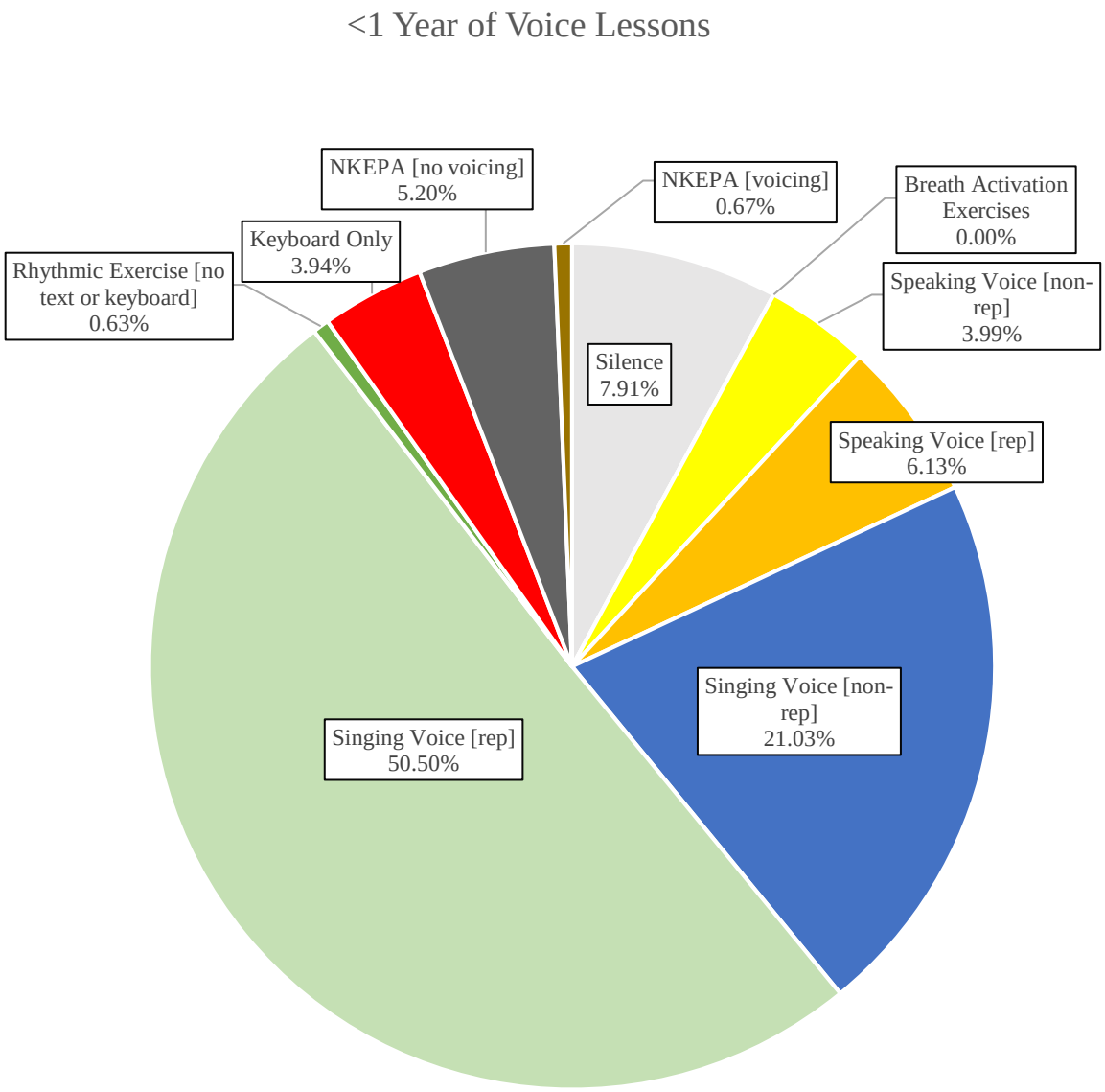

Figure K7. Aggregated mean percentages of time spent during the first 15 minutes across practice sessions by participants reporting less than 1 year of voice lessons (*N* = 3)

Figure K8 shows the percentage of time spent on each category of behaviors across all practice sessions by participants who reported 1-2 years of voice lessons (*N* = 6).

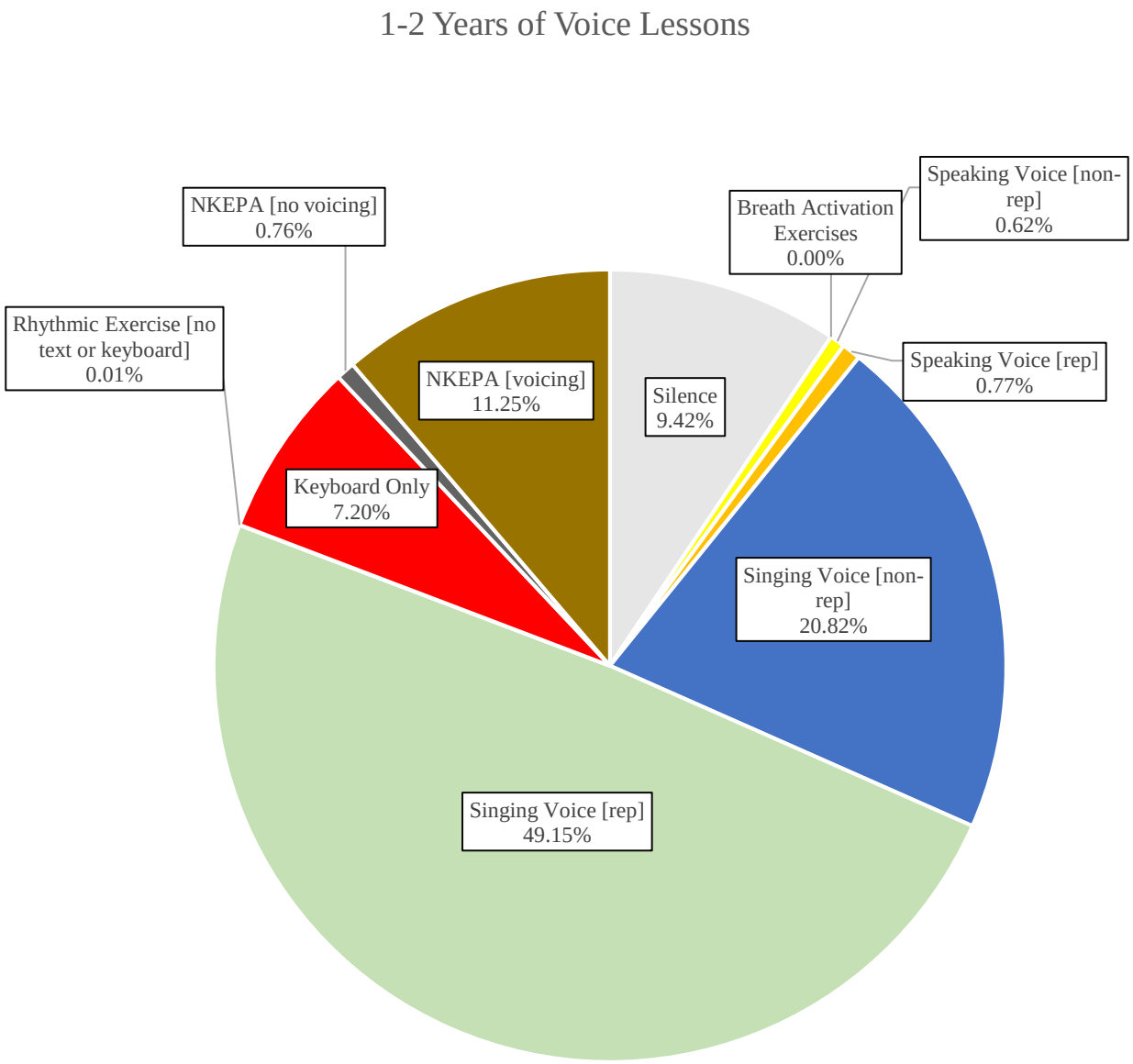

Figure K8. Aggregated mean percentages of time spent during the first 15 minute across practice sessions by participants reporting 1-2 years of voice lessons (*N* = 6)

Figure K9 presents the percentage of time spent on each category of behaviors across all practice sessions by participants who reported 3-5 years of voice lessons (*N* = 7).

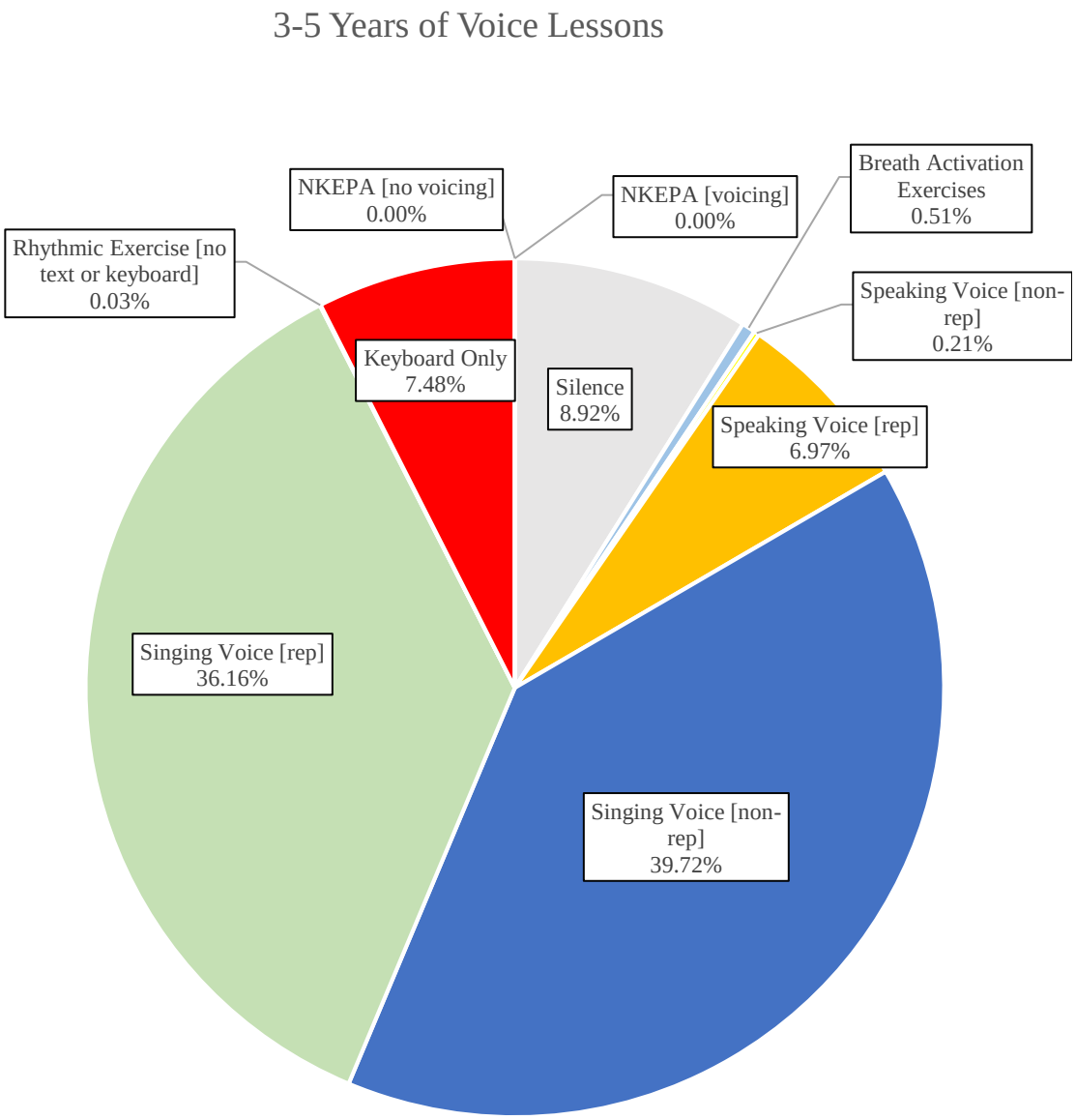

Figure K9. Aggregated mean percentages of time spent during the first 15 minutes across practice sessions by participants reporting 3-5 years of voice lessons (*N* = 7)

Figure K10 displays the percentage of time spent on each category of behaviors across all practice sessions by participants who reported 6-9 years of voice lessons (*N* = 11).

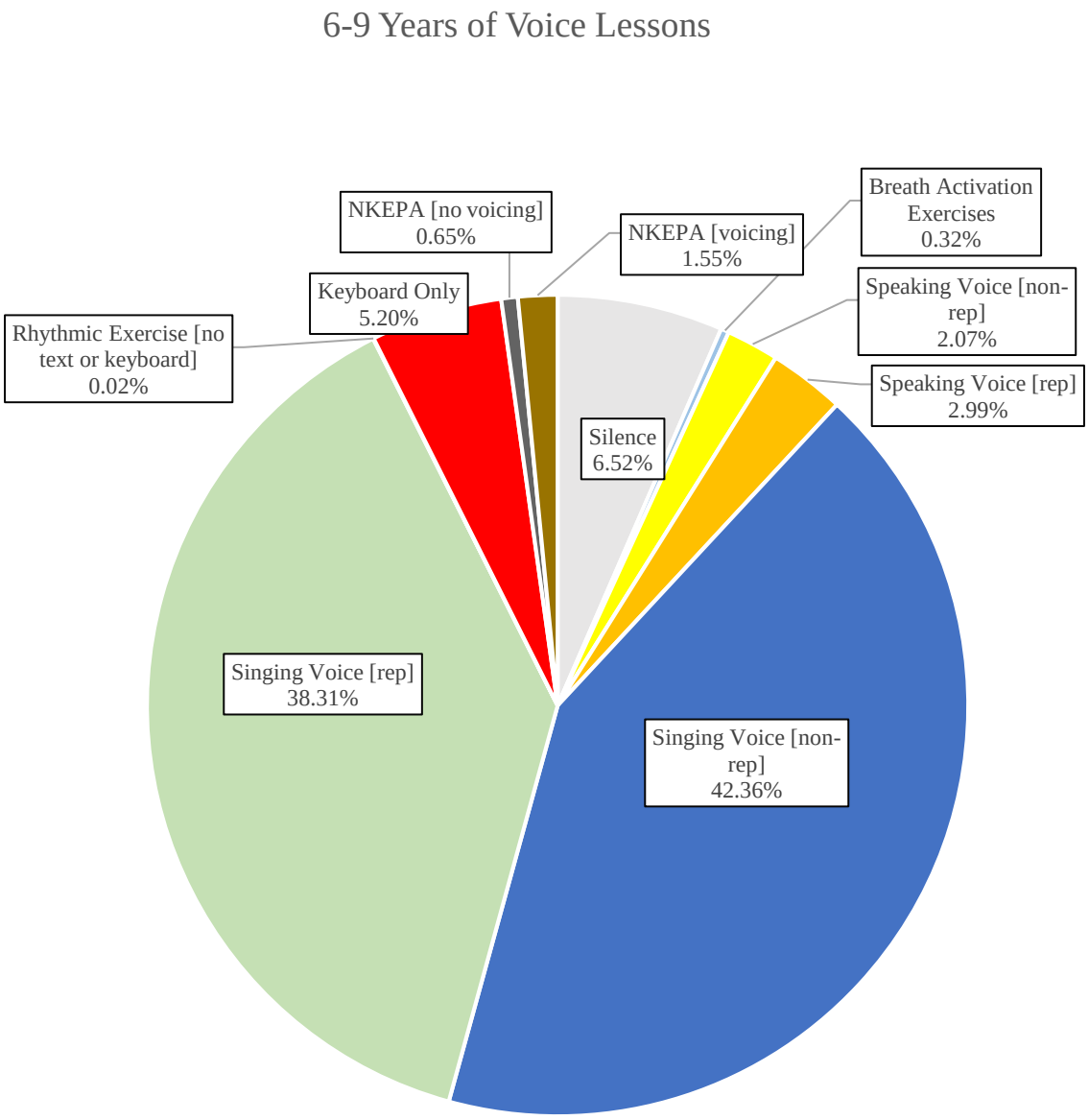

Figure K10. Aggregated mean percentages of time spent during the first 15 minutes across practice sessions by participants reporting 6-9 years of voice lessons (*N* = 11)

Figure K11 shows the percentage of time spent on each category of behaviors across all practice sessions by participants who reported 10 or more years of voice lessons (*N* = 13).

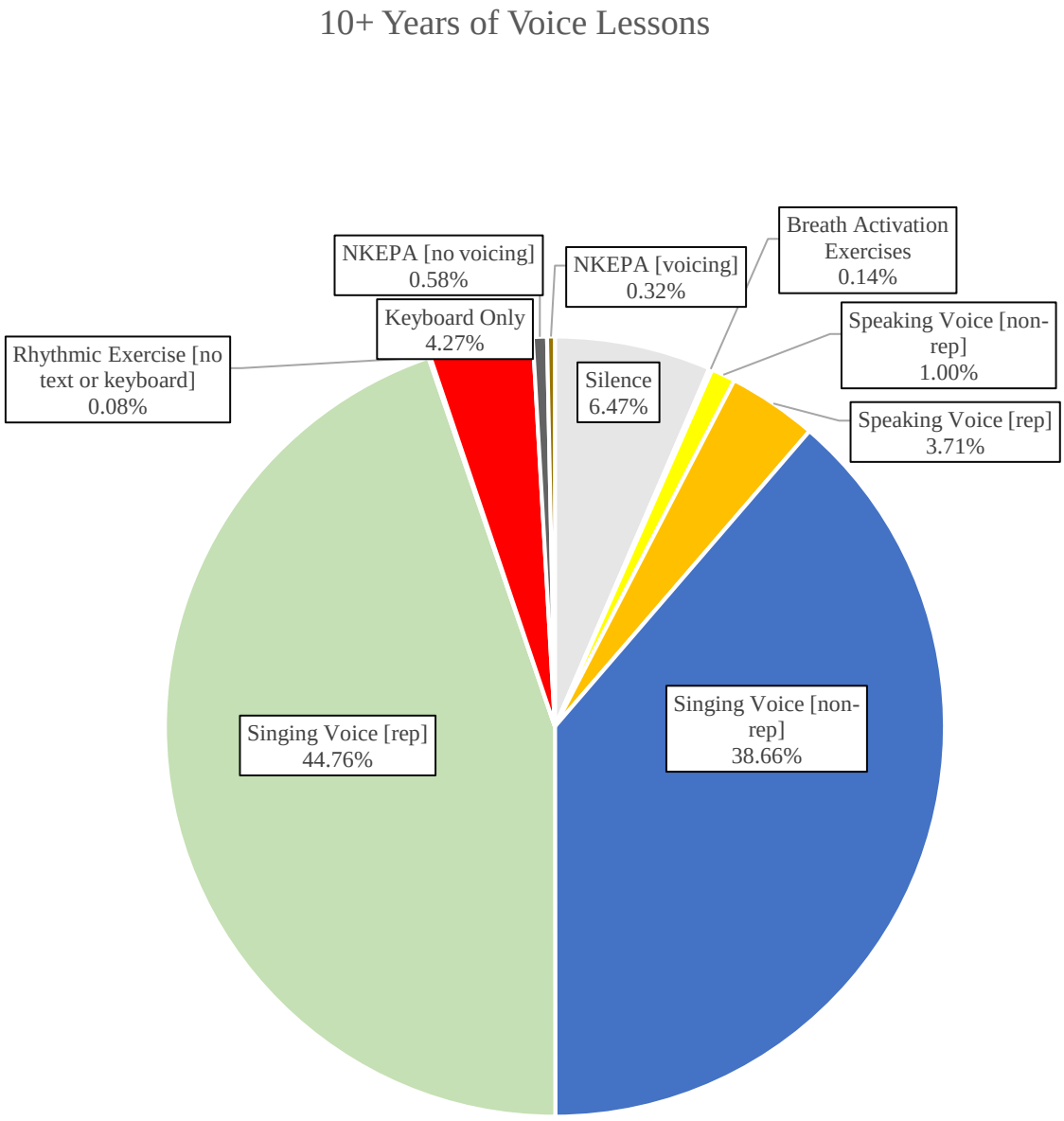

Figure K11. Aggregated mean percentages of time spent during the first 15 minutes across practice sessions by participants reporting 10 or more years of voice lessons (*N* = 13)

Appendix L

Aggregate Practice Behaviors by Individual Participants Across All Five Practice Sessions and Chronological Overviews of Each Individual Session (Research Question Three).

Figures L1 – L240 show the average percentage of time spent on behavioral categories for each individual participant, as well as a chronological overview of each participant's behaviors during each individual session.

Participant 1. Figure L1 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 1.

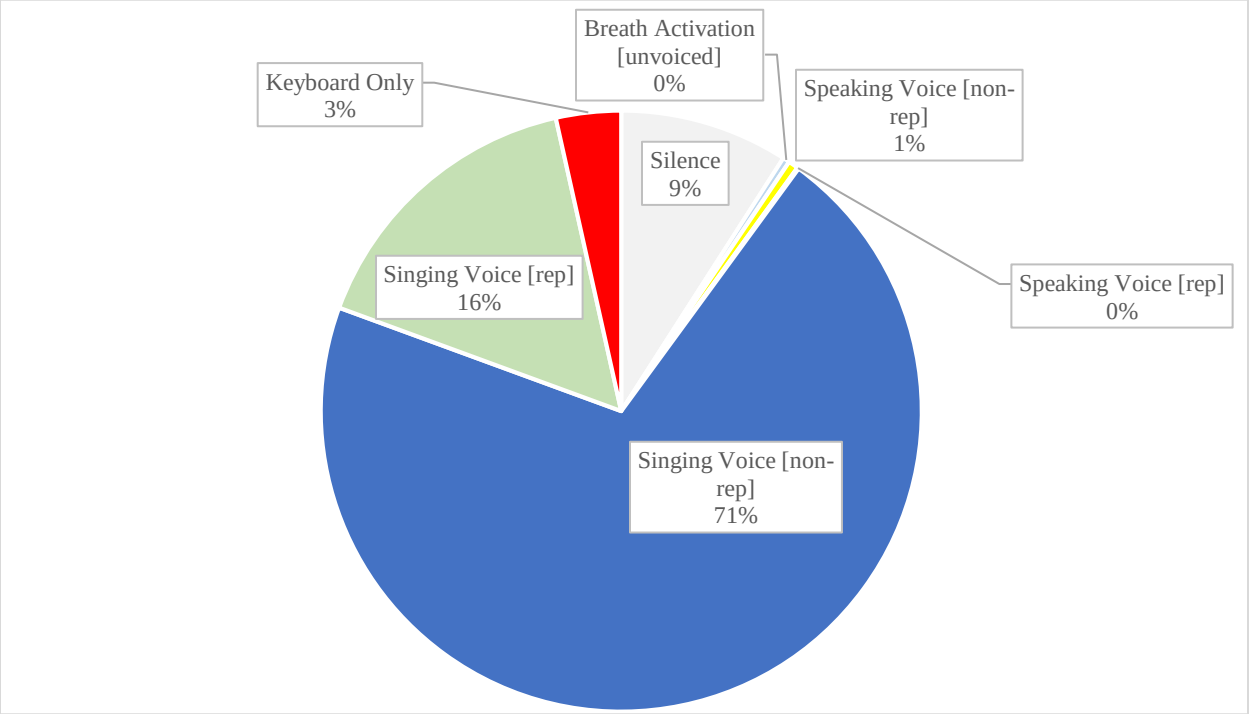

Figure L1. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 1.

Figures L2 – L6 present the chronological order of observed behavioral categories for each individual session by Participant 1.

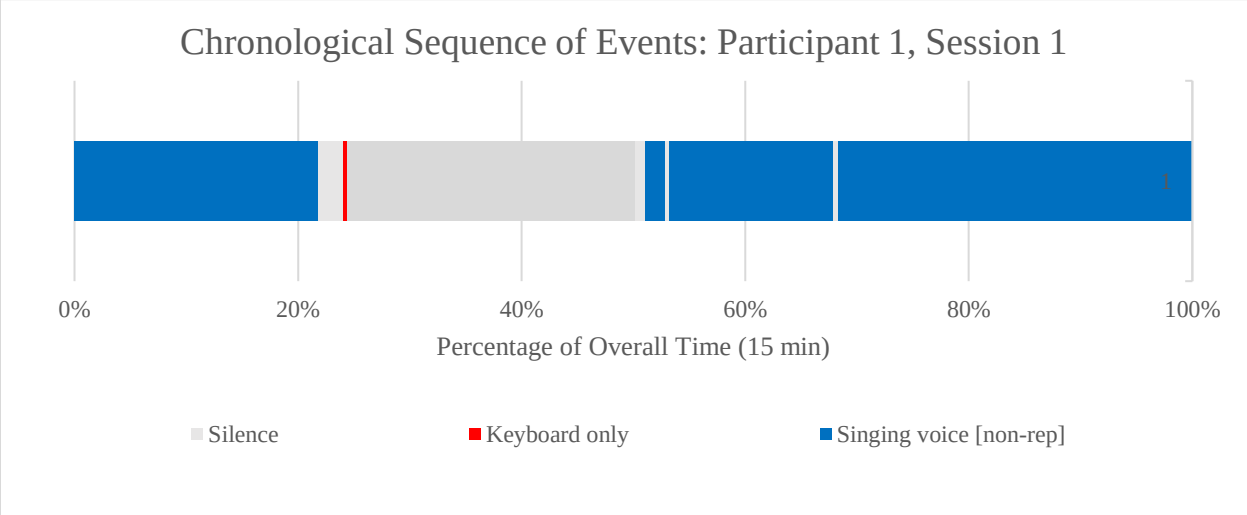

Figure L2. Chronological order of observed behavioral categories: Participant 1, Session 1.

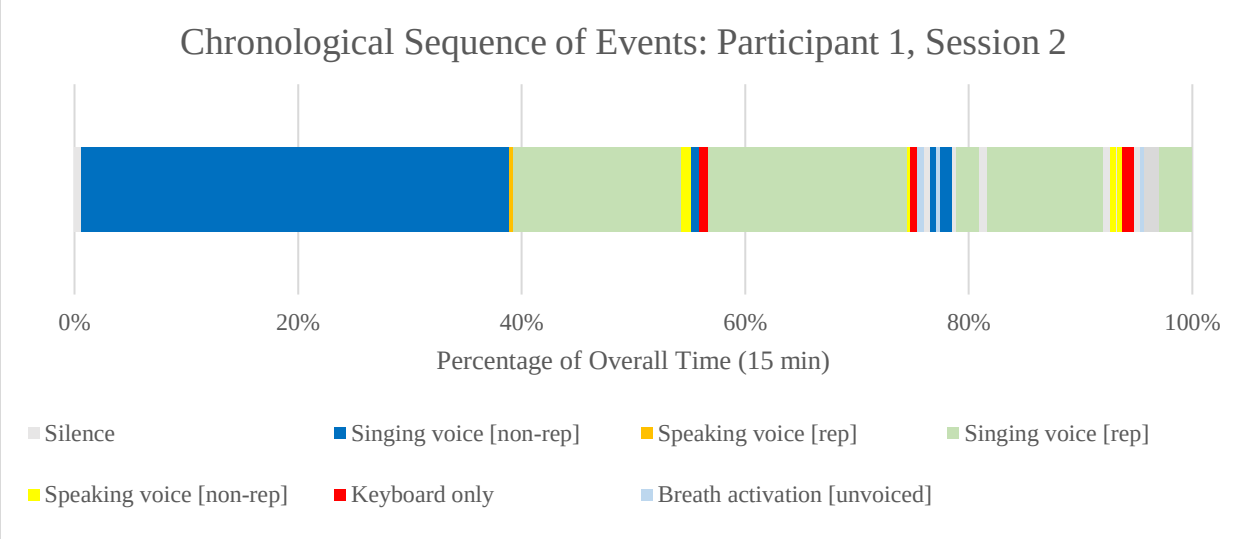

Figure L3. Chronological order of observed behavioral categories: Participant 1, Session 2.

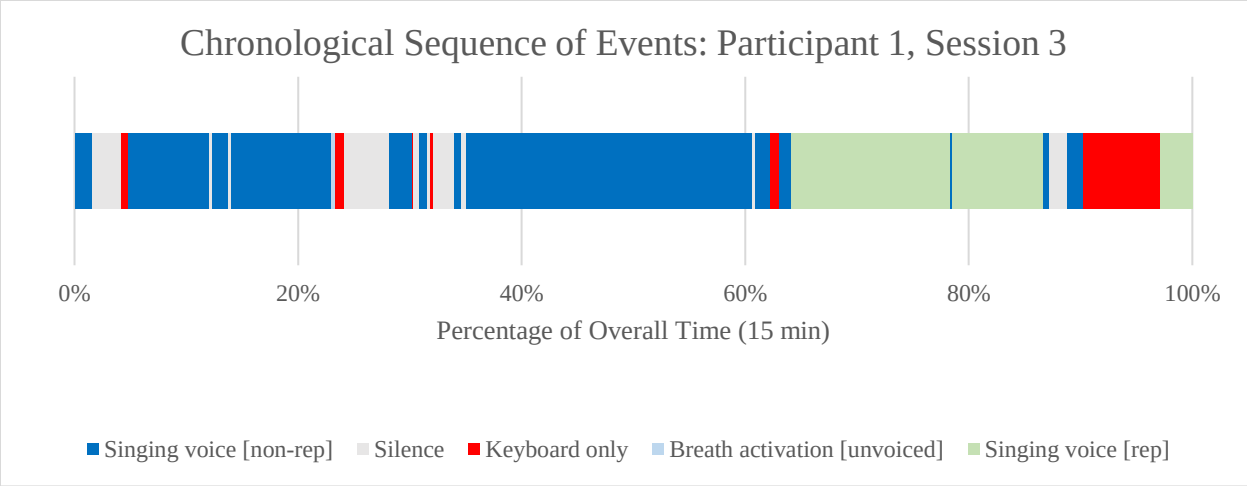

Figure L4. Chronological order of observed behavioral categories: Participant 1, Session 3.

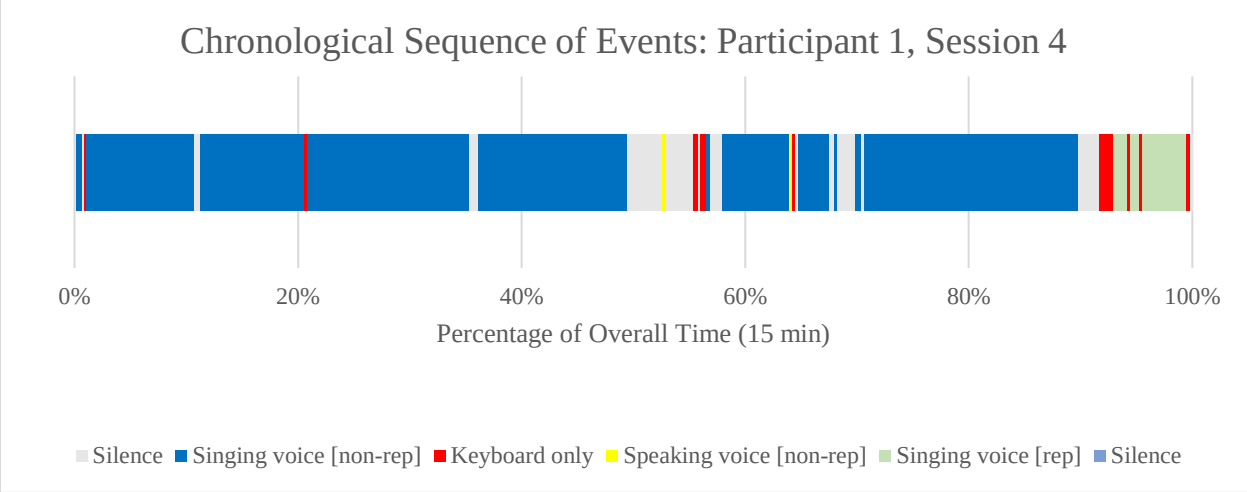

Figure L5. Chronological order of observed behavioral categories: Participant 1, Session 4.

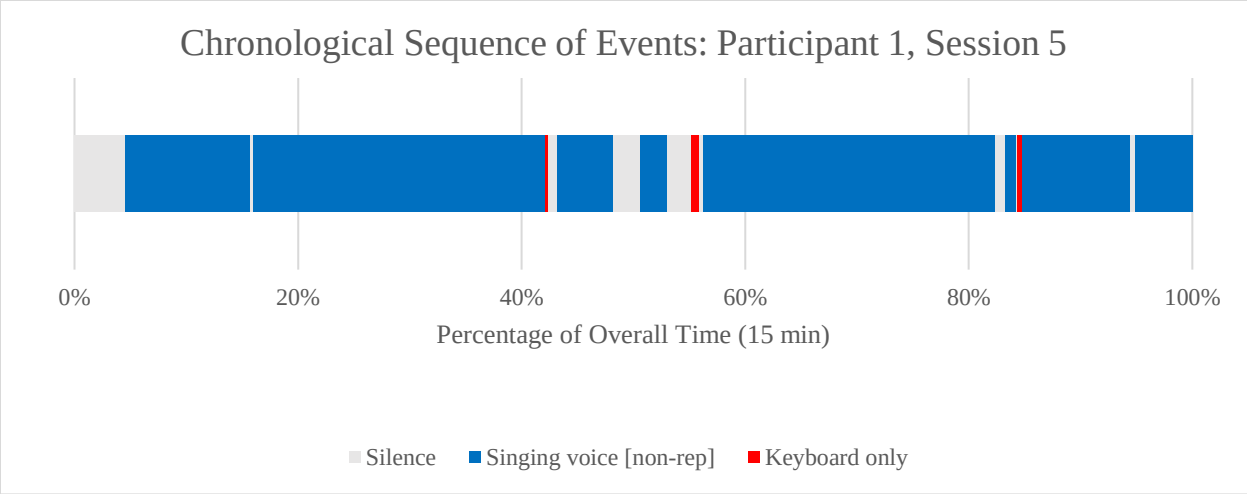

Figure L6. Chronological order of observed behavioral categories: Participant 1, Session 5.

Participant 2. Figure L7 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 2.

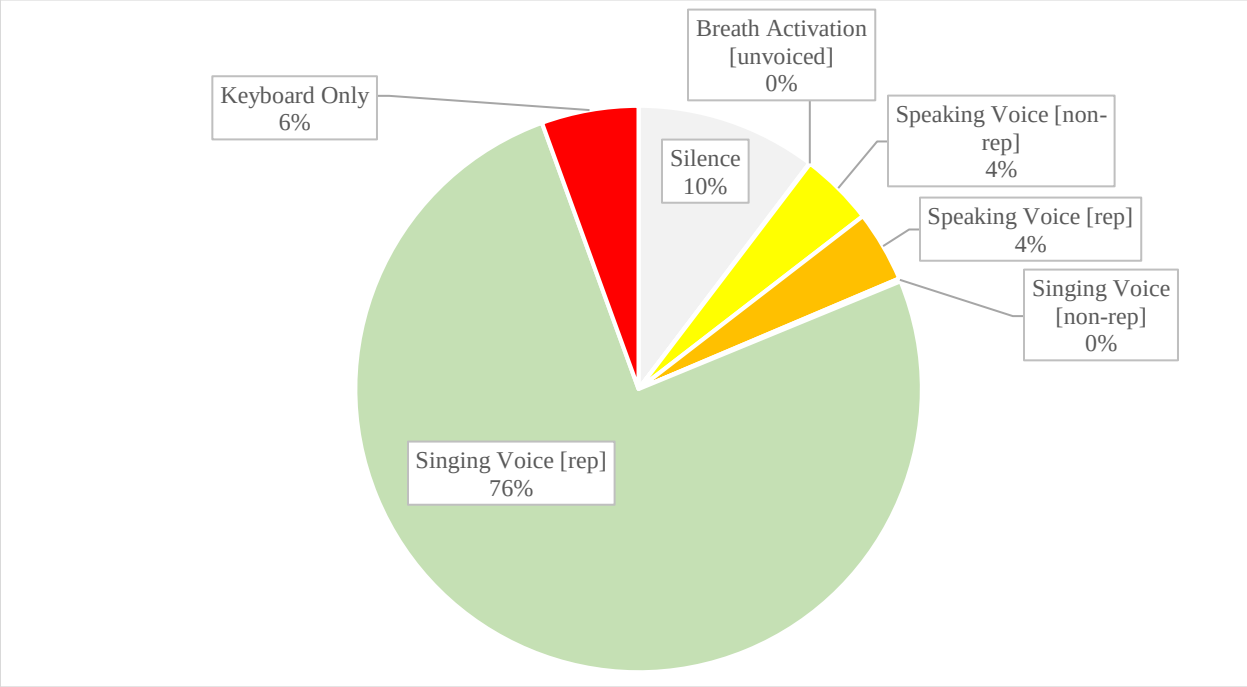

Figure L7. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 2.

Figures L8 – L12 present the chronological order of observed behavioral categories for each individual session by Participant 2.

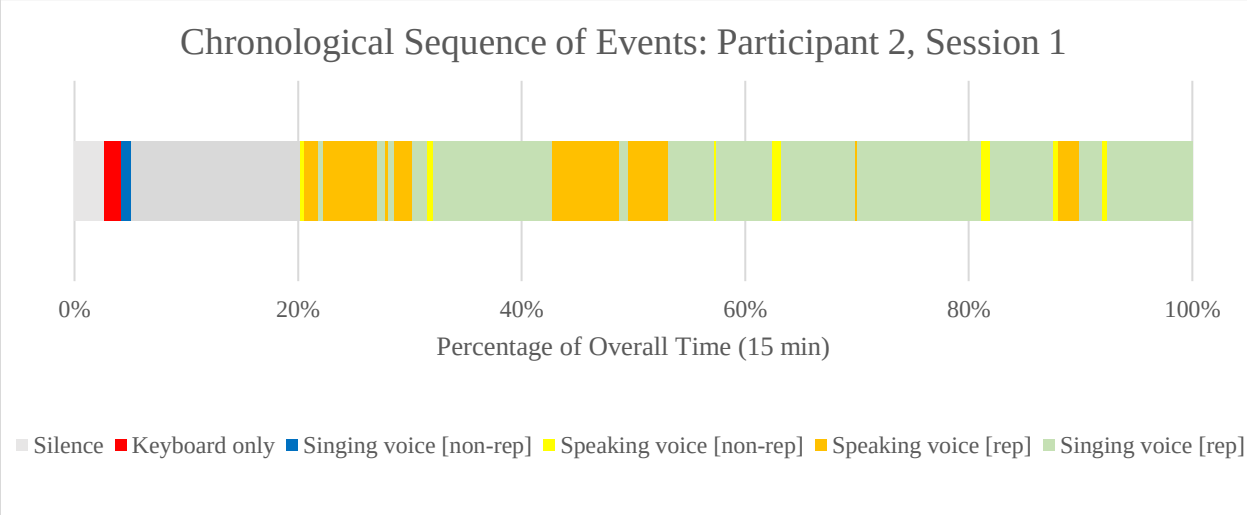

Figure L8. Chronological order of observed behavioral categories: Participant 2, Session 1.

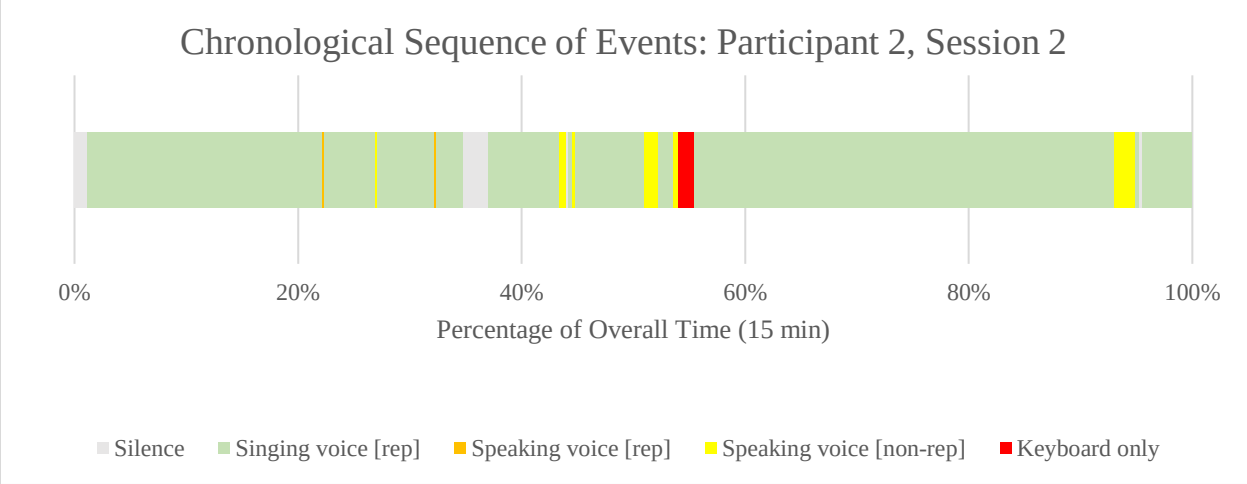

Figure L9. Chronological order of observed behavioral categories: Participant 2, Session 2.

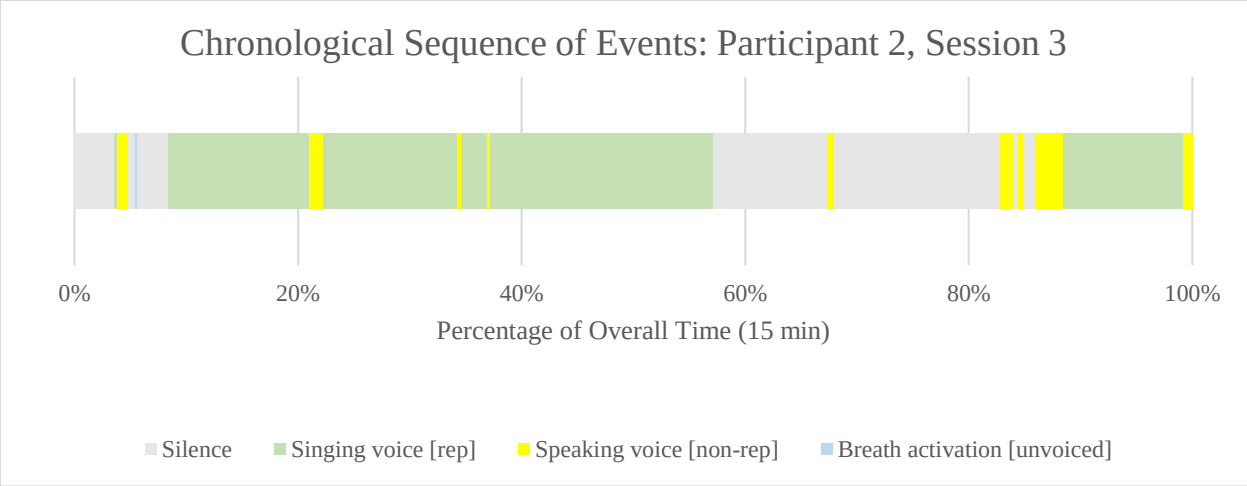

Figure L10. Chronological order of observed behavioral categories: Participant 2, Session 3.

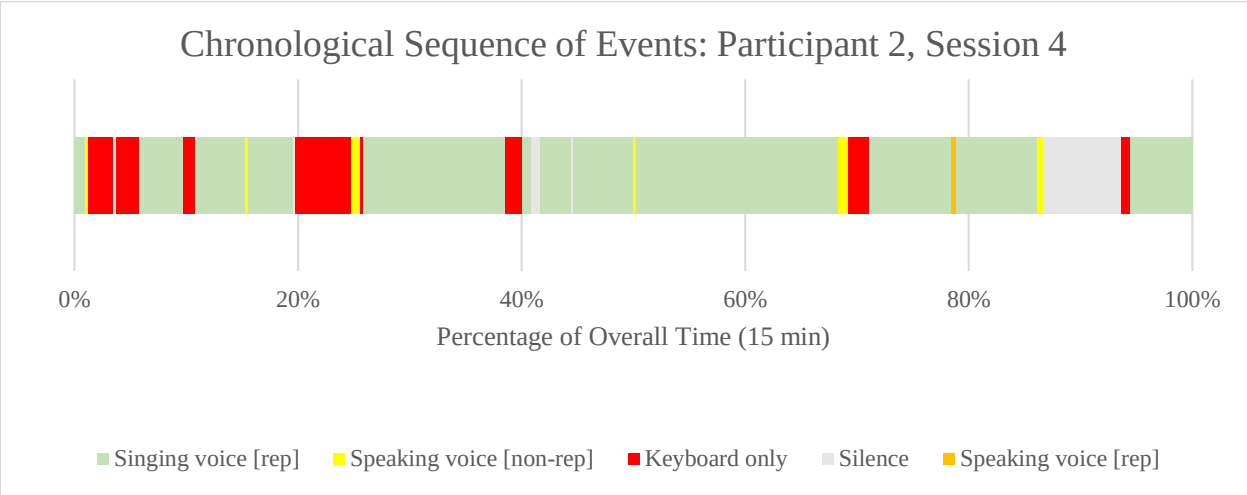

Figure L11. Chronological order of observed behavioral categories: Participant 2, Session 4.

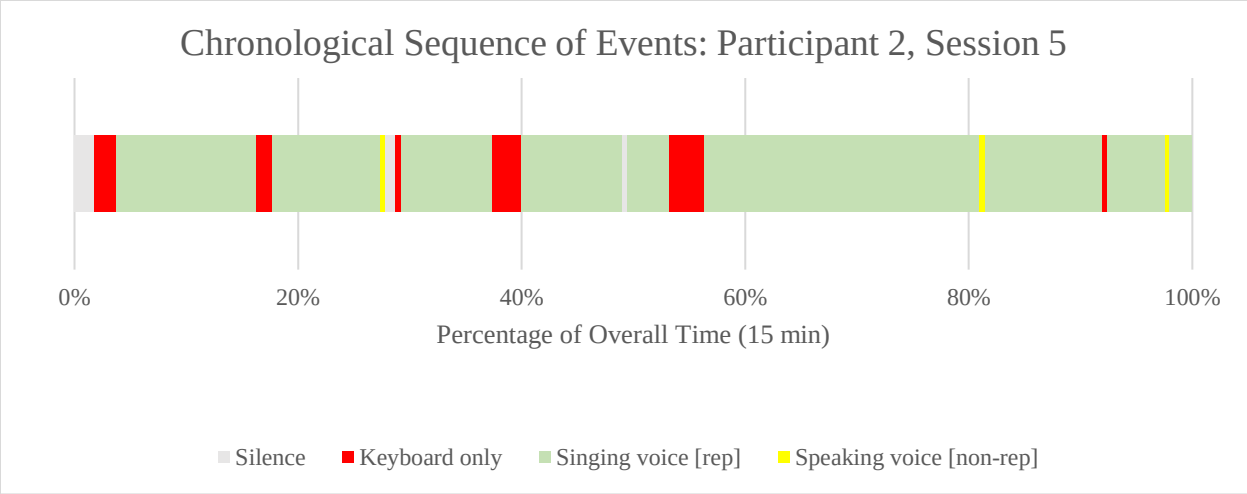

Figure L12. Chronological order of observed behavioral categories: Participant 2, Session 5.

Participant 3. Figure L13 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 3.

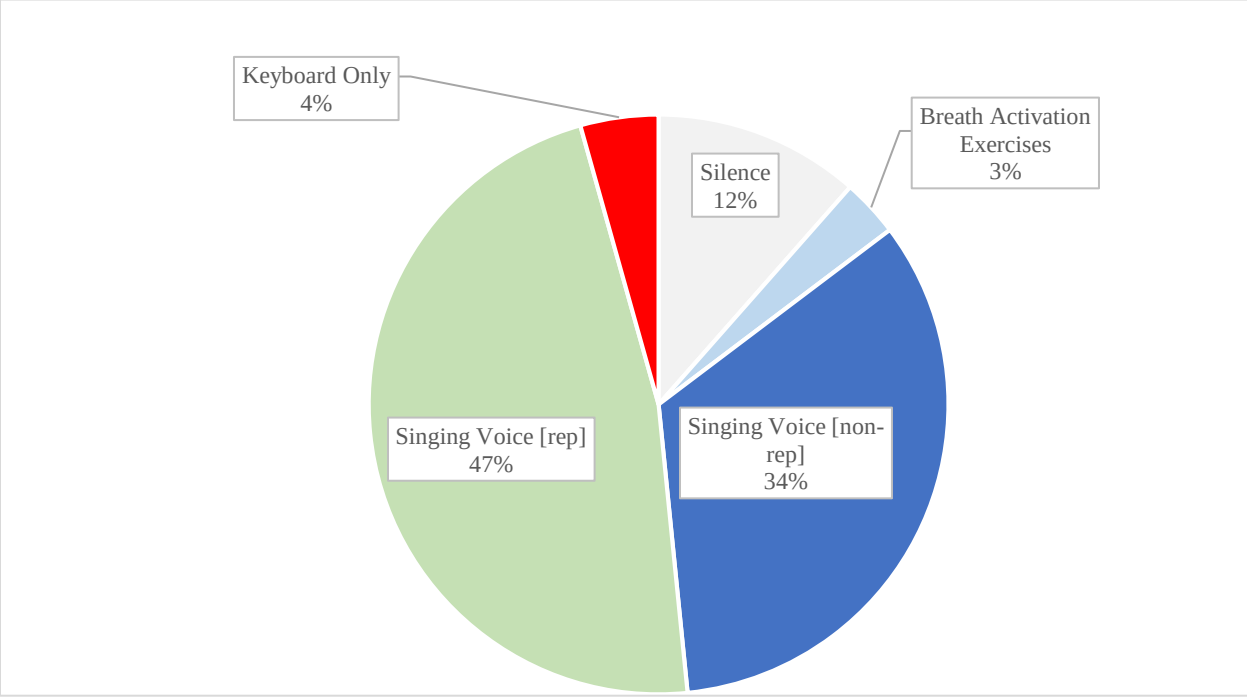

Figure L13. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 3.

Figures L14 – L18 present the chronological order of observed behavioral categories for each individual session by Participant 3.

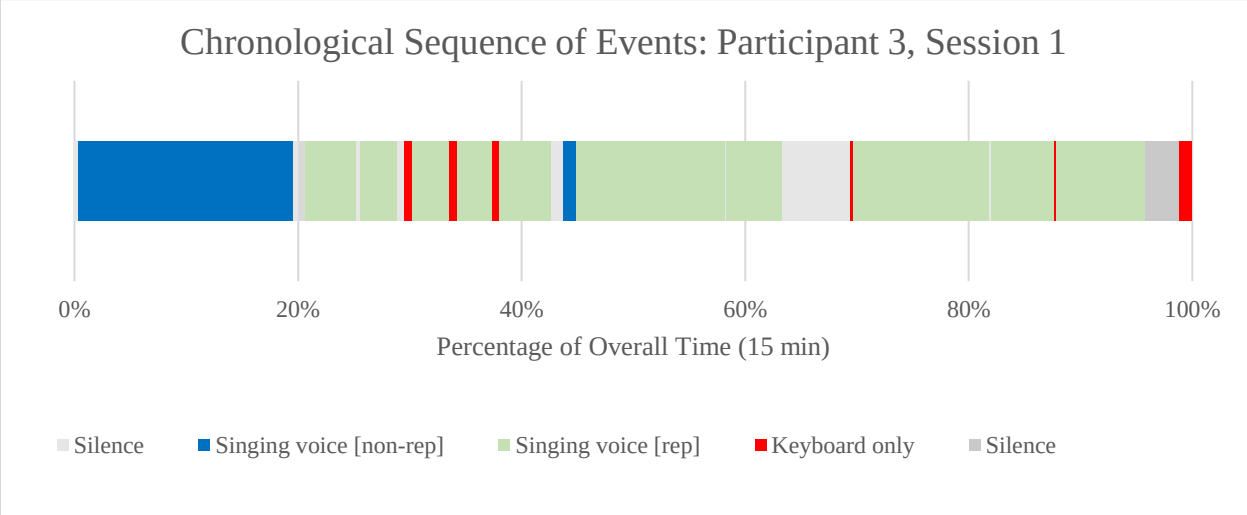

Figure L14. Chronological order of observed behavioral categories: Participant 3, Session 1.

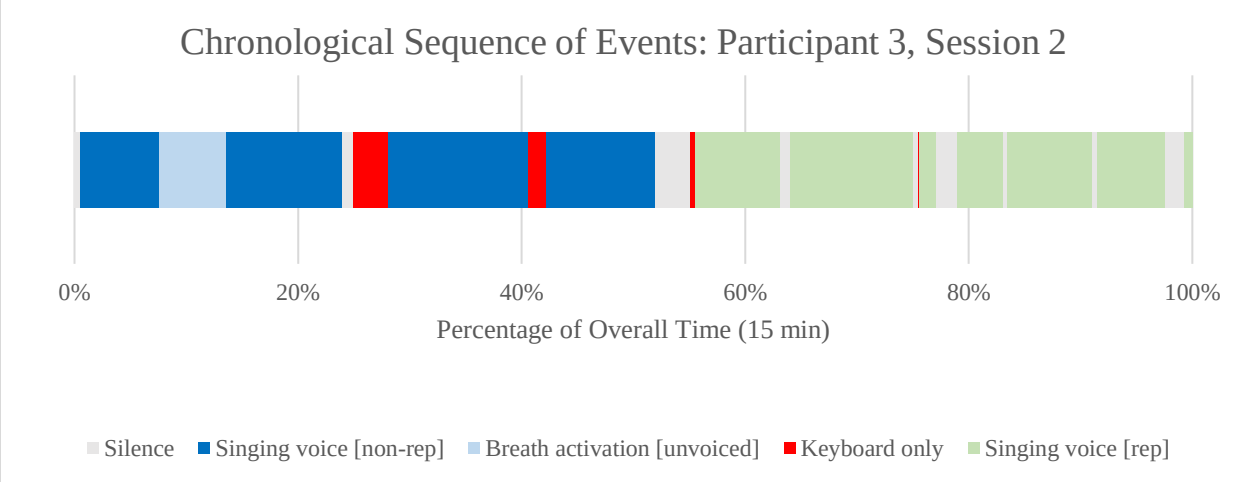

Figure L15. Chronological order of observed behavioral categories: Participant 3, Session 2.

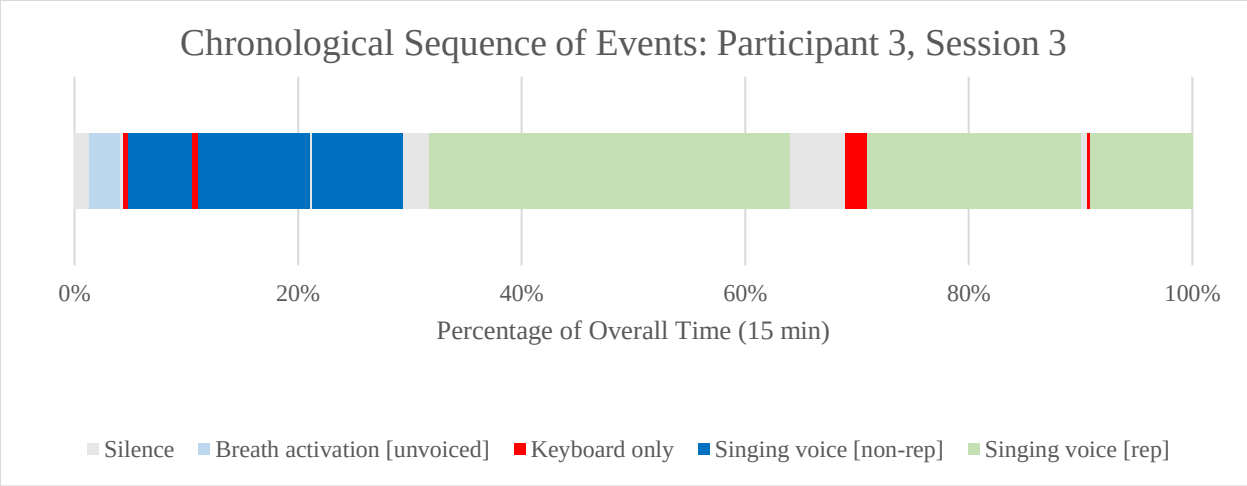

Figure L16. Chronological order of observed behavioral categories: Participant 3, Session 3.

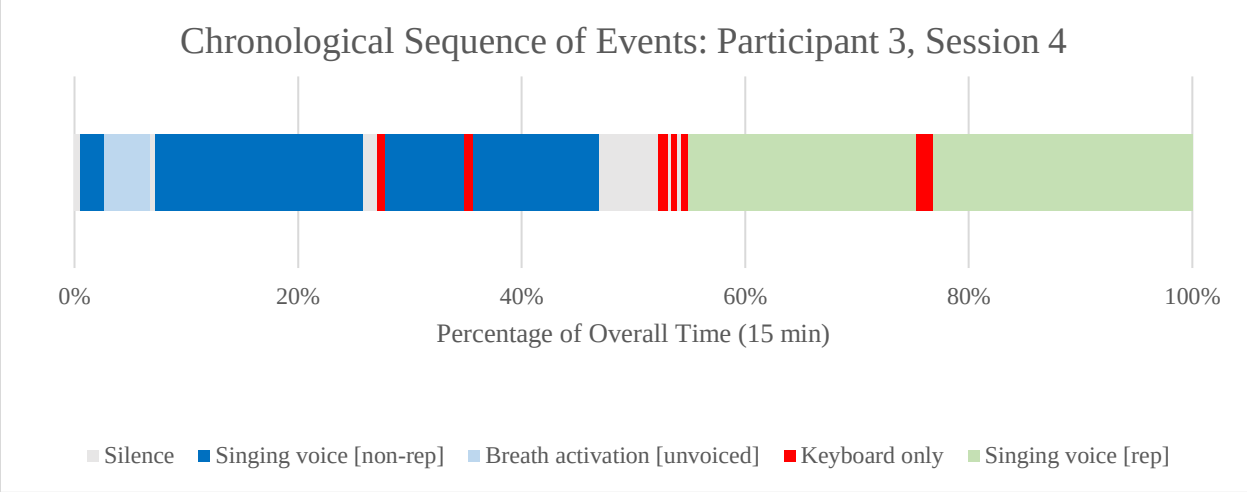

Figure L17. Chronological order of observed behavioral categories: Participant 3, Session 4.

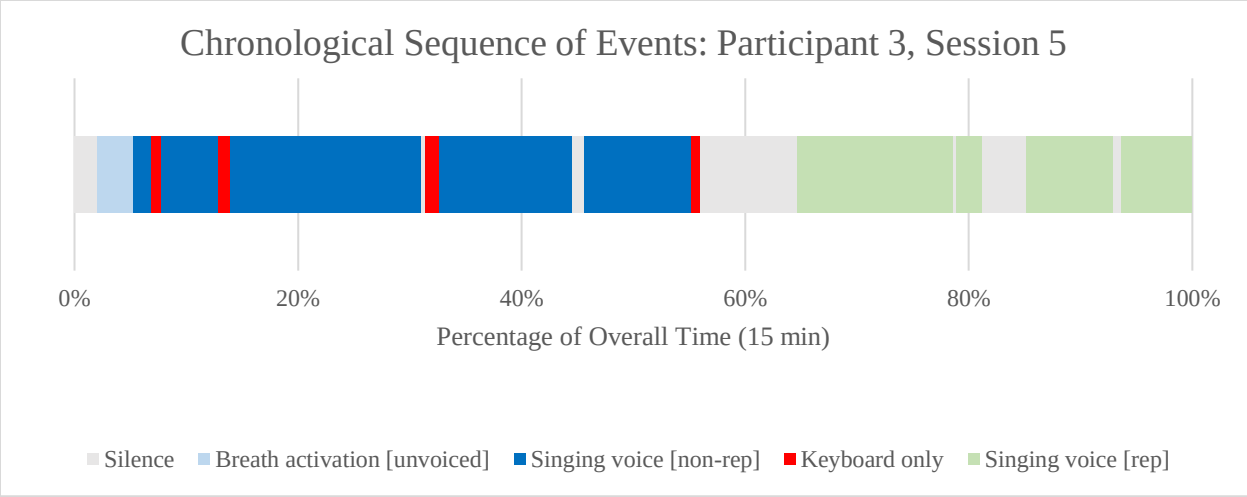

Figure L18. Chronological order of observed behavioral categories: Participant 3, Session 5.

Participant 4. Figure L19 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 4.

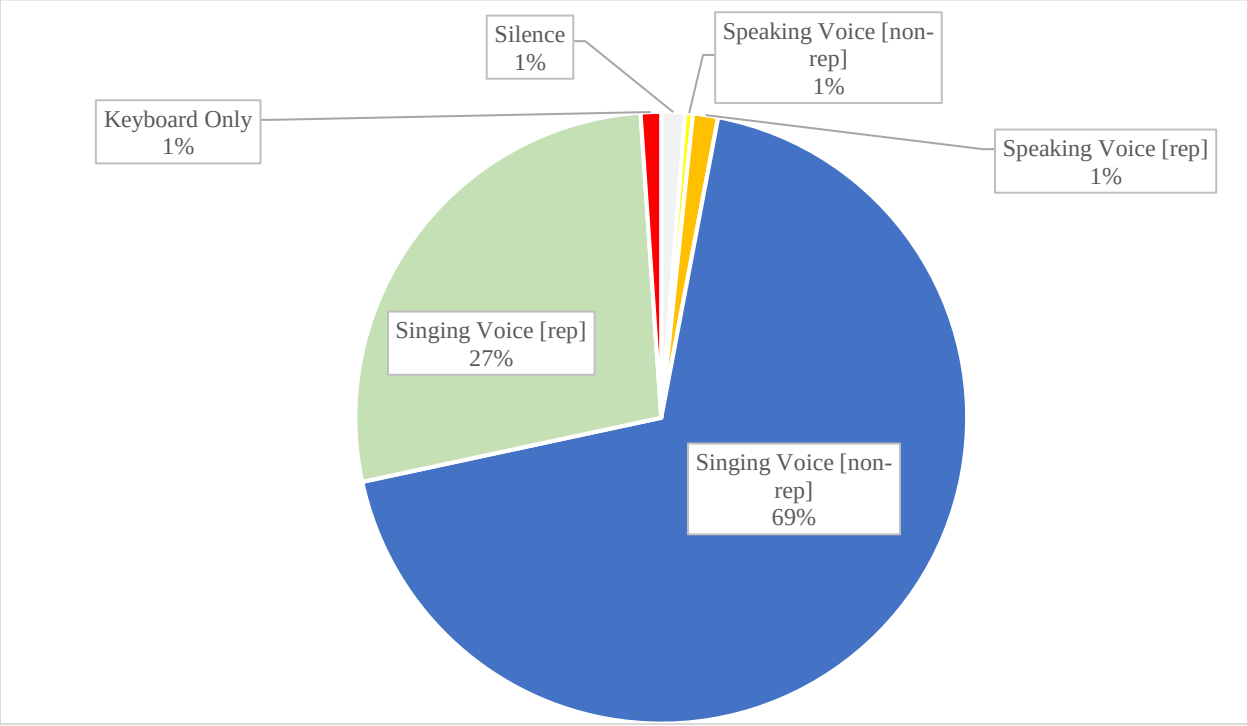

Figure L19. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 4.

Figures L20 – L24 present the chronological order of observed behavioral categories for each individual session by Participant 4.

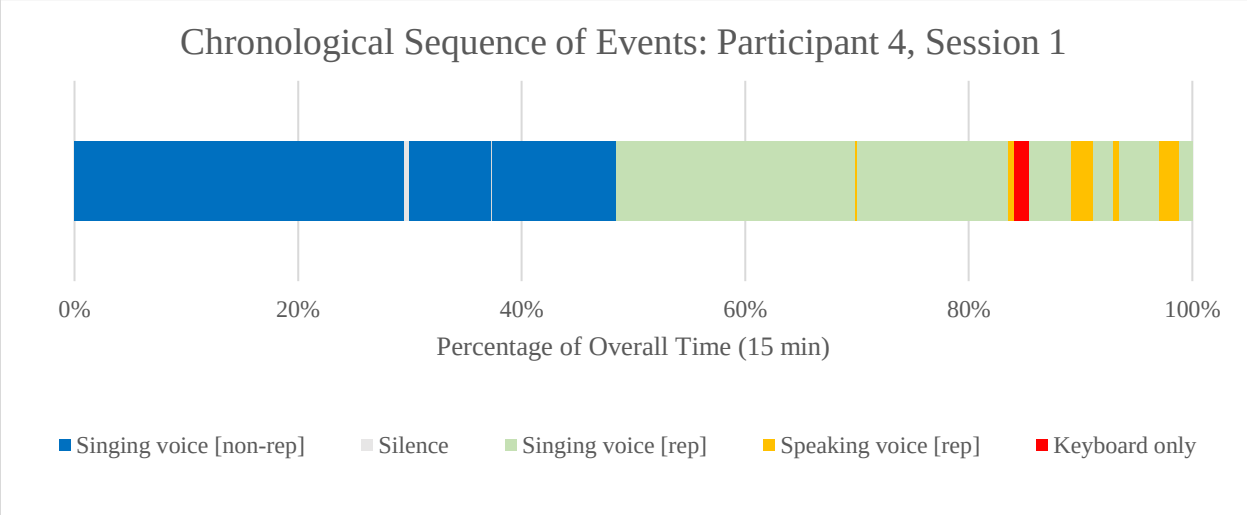

Figure L20. Chronological order of observed behavioral categories: Participant 4, Session 1.

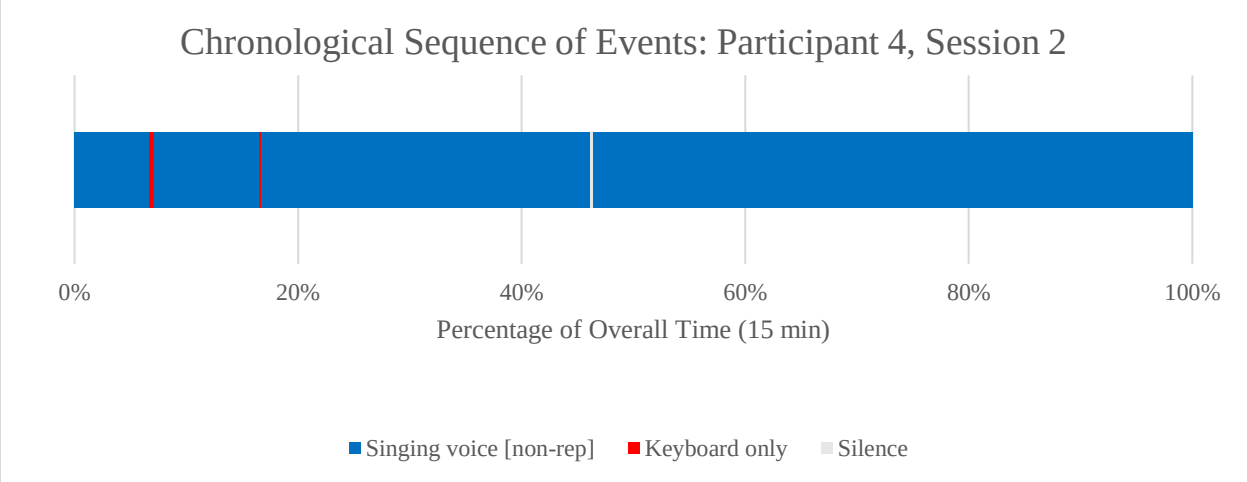

Figure L21. Chronological order of observed behavioral categories: Participant 4, Session 2.

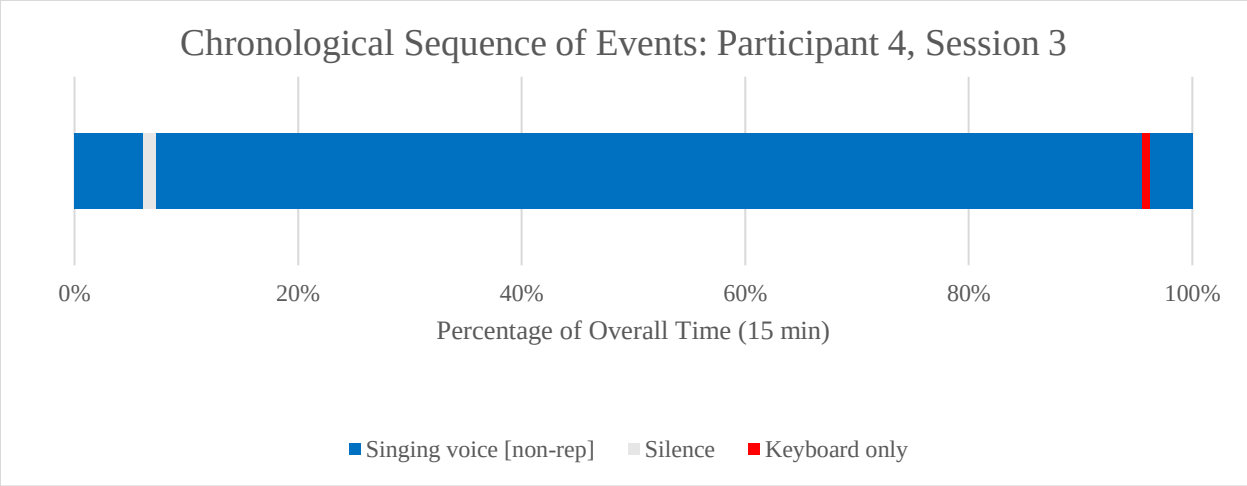

Figure L22. Chronological order of observed behavioral categories: Participant 4, Session 3.

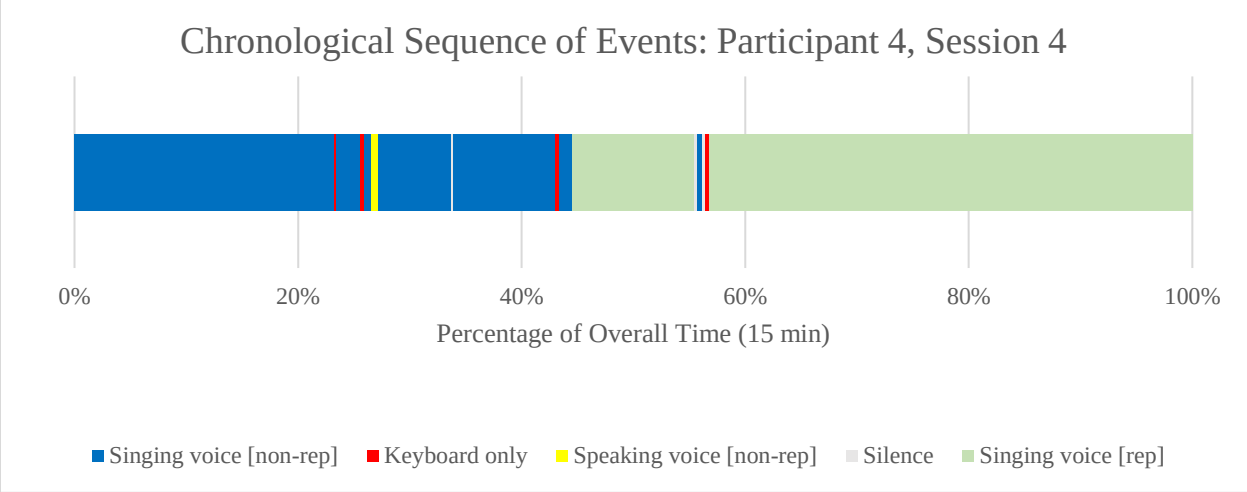

Figure L23. Chronological order of observed behavioral categories: Participant 4, Session 4.

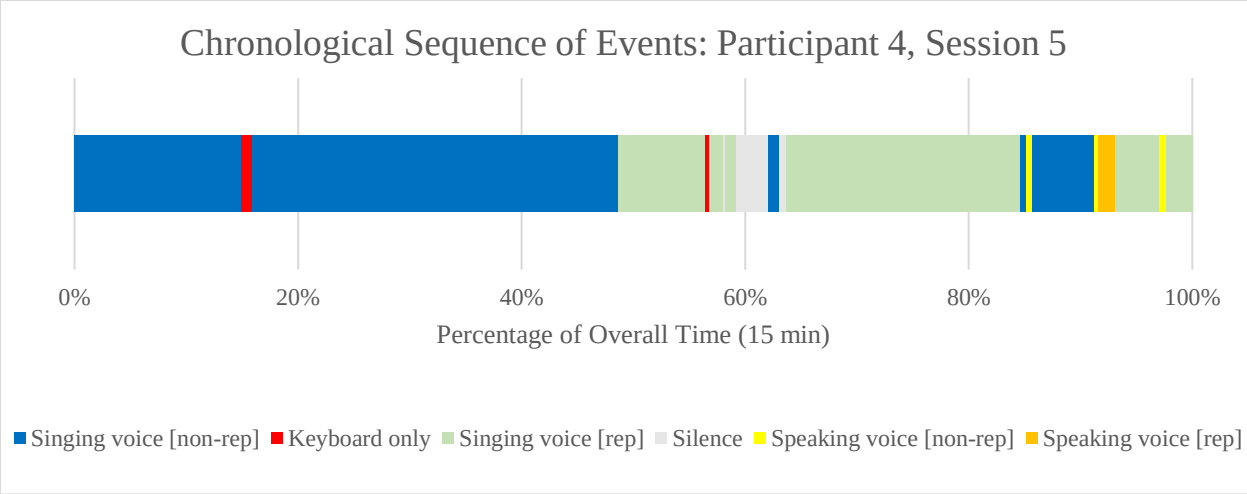

Figure L24. Chronological order of observed behavioral categories: Participant 4, Session 5.

Participant 5. Figure L25 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 5.

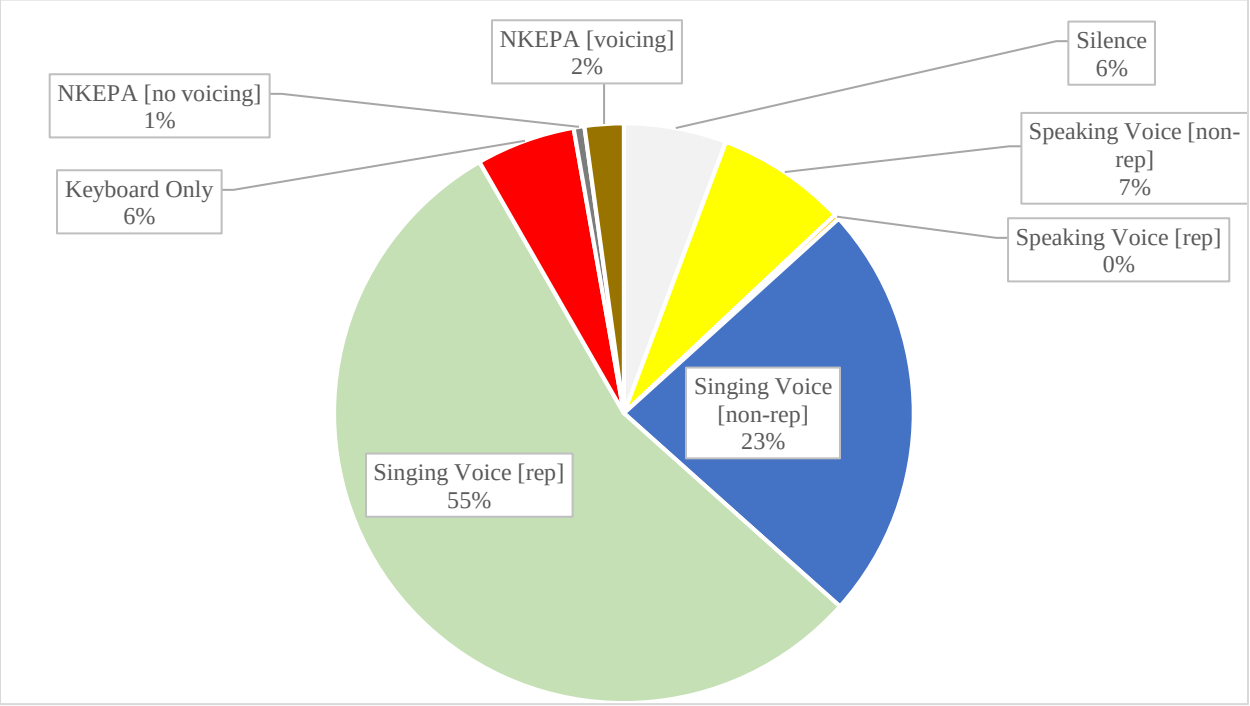

Figure L25. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 5.

Figures L26 – L30 present the chronological order of observed behavioral categories for each individual session by Participant 5.

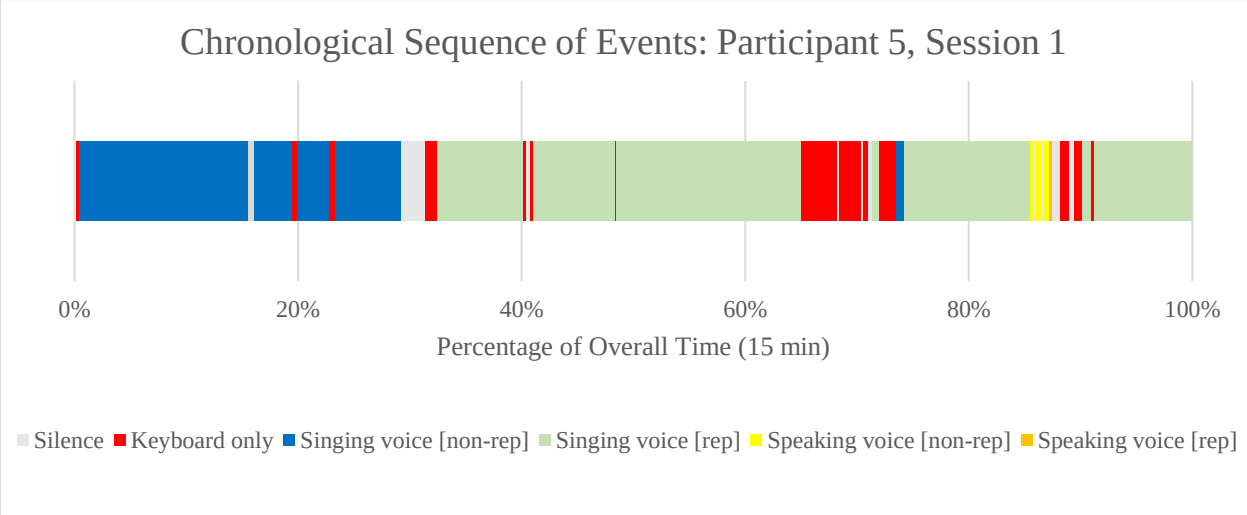

Figure L26. Chronological order of observed behavioral categories: Participant 5, Session 1.

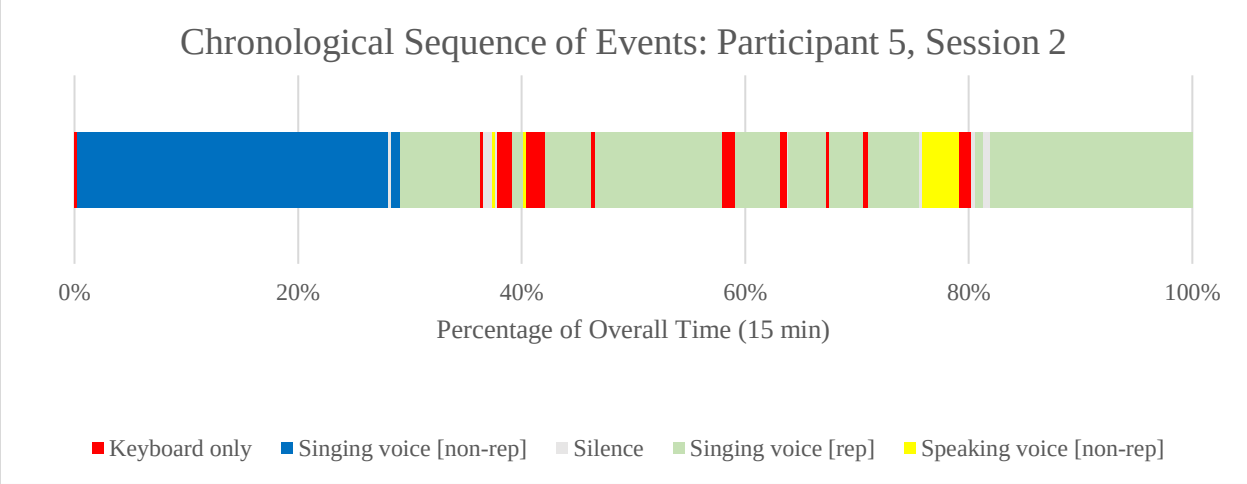

Figure L27. Chronological order of observed behavioral categories: Participant 5, Session 2.

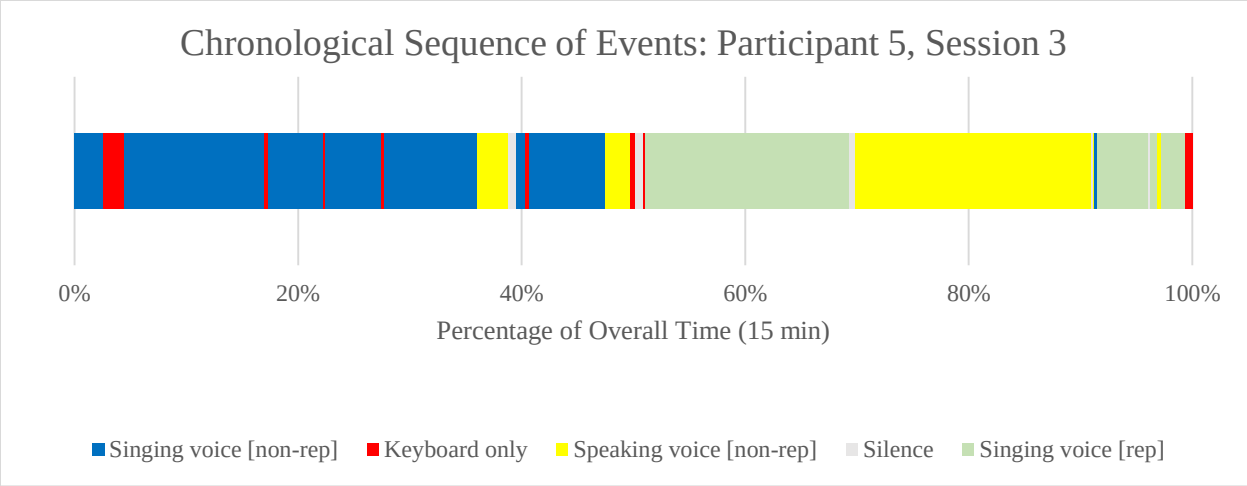

Figure L28. Chronological order of observed behavioral categories: Participant 5, Session 3.

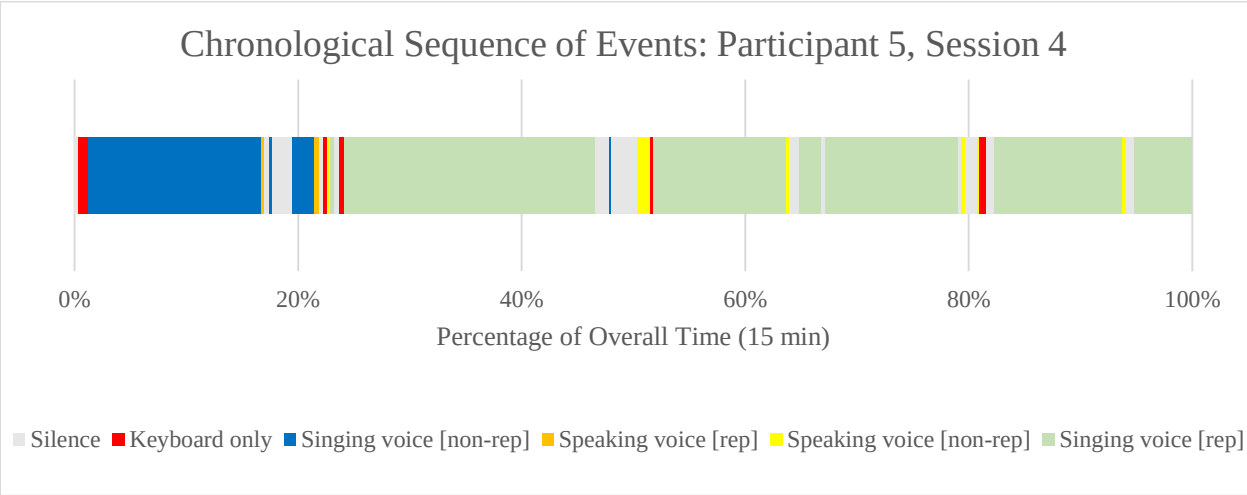

Figure L29. Chronological order of observed behavioral categories: Participant 5, Session 4.

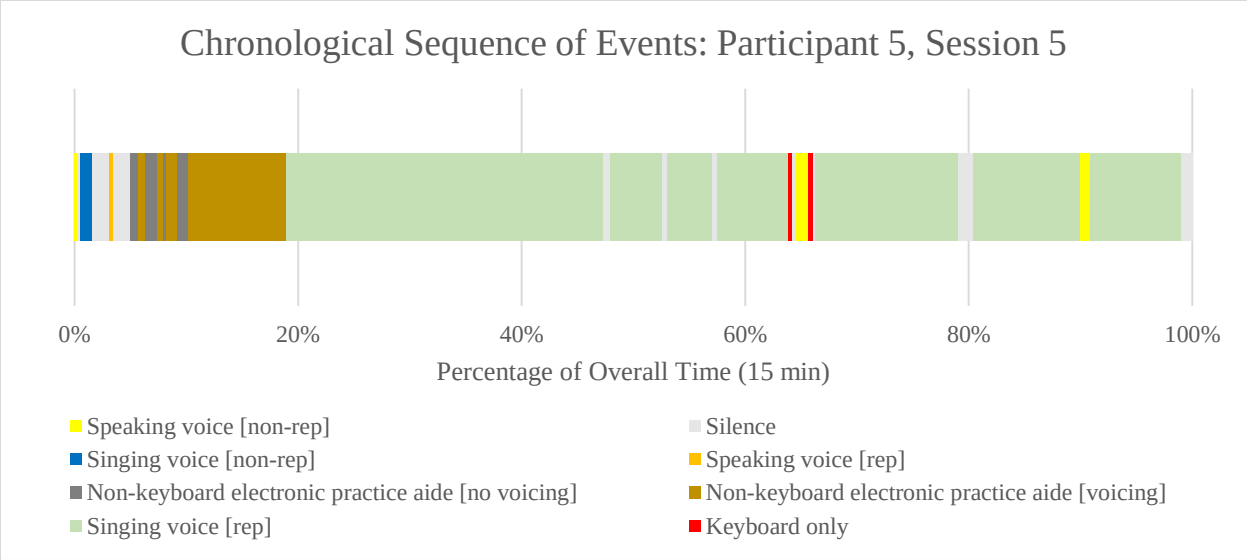

Figure L30. Chronological order of observed behavioral categories: Participant 5, Session 5.

Participant 6. Figure L31 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 6.

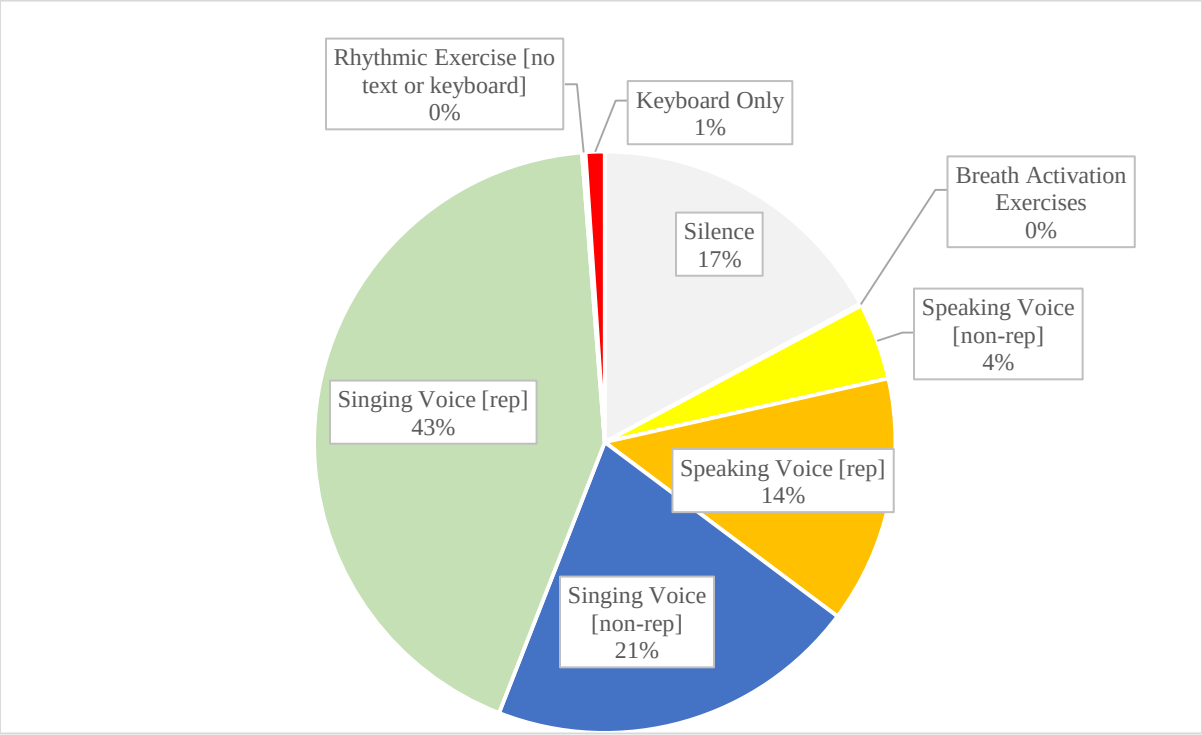

Figure L31. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 6.

Figures L32 – L36 present the chronological order of observed behavioral categories for each individual session by Participant 6.

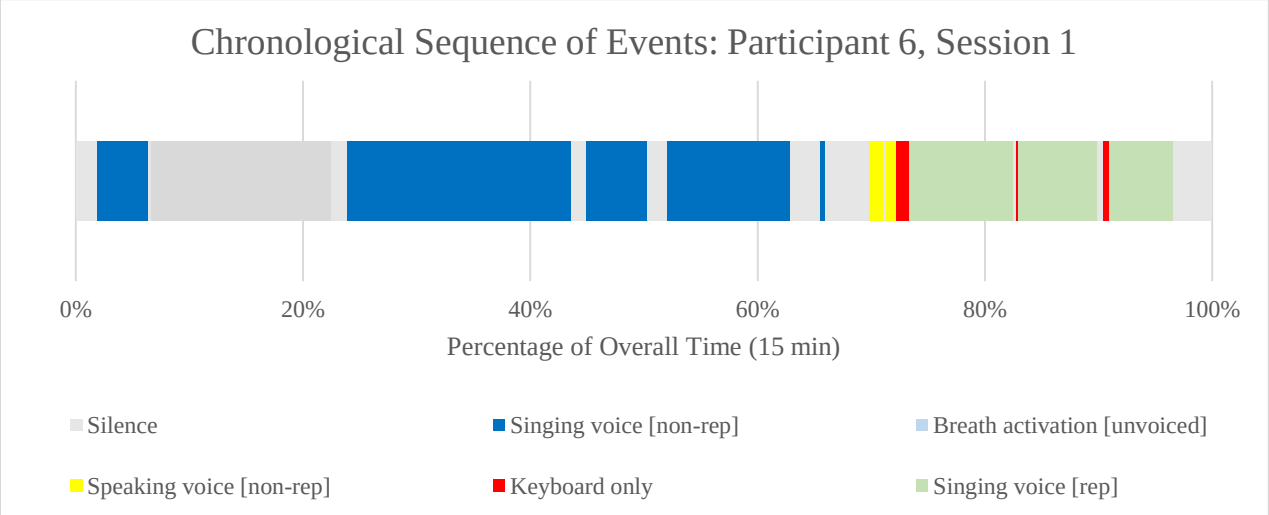

Figure L32. Chronological order of observed behavioral categories: Participant 6, Session 1.

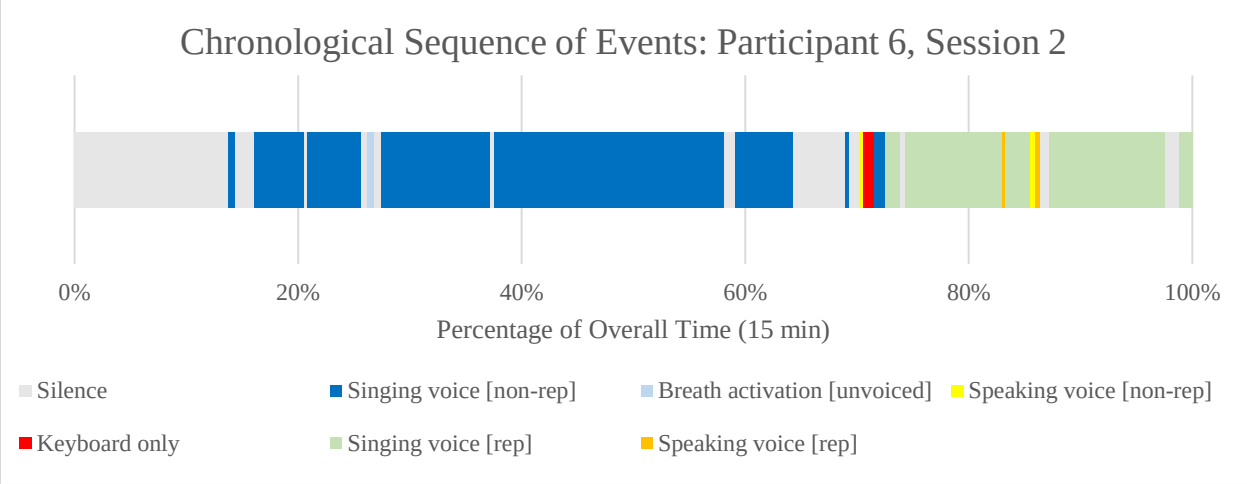

Figure L33. Chronological order of observed behavioral categories: Participant 6, Session 2.

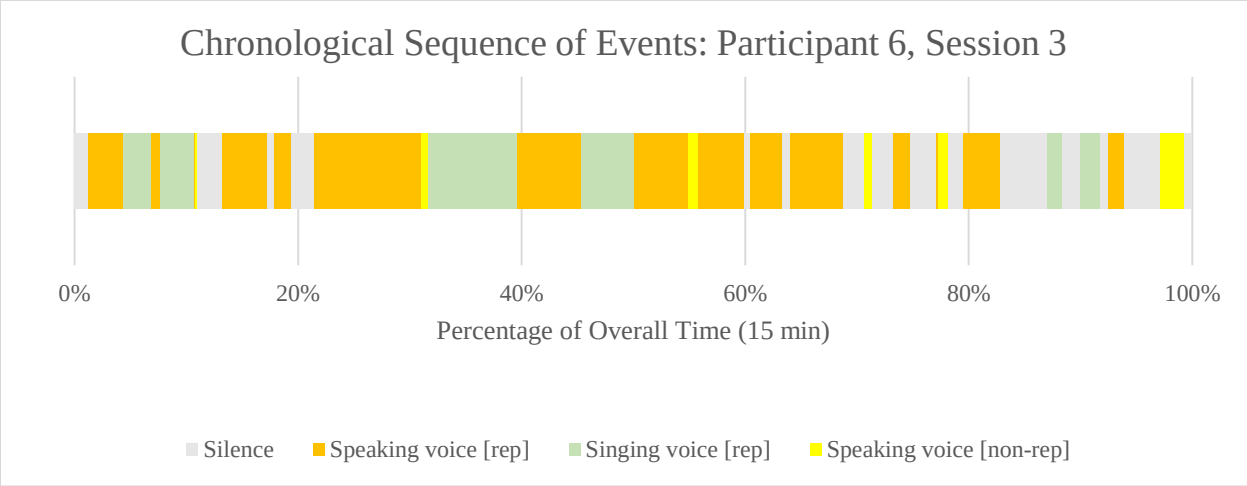

Figure L34. Chronological order of observed behavioral categories: Participant 6, Session 3.

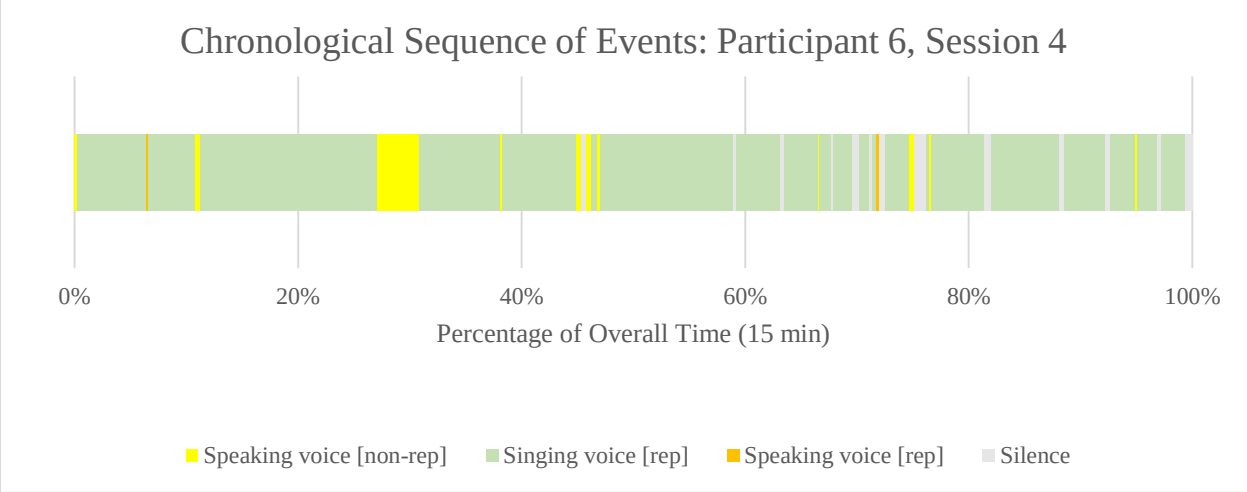

Figure L35. Chronological order of observed behavioral categories: Participant 6, Session 4.

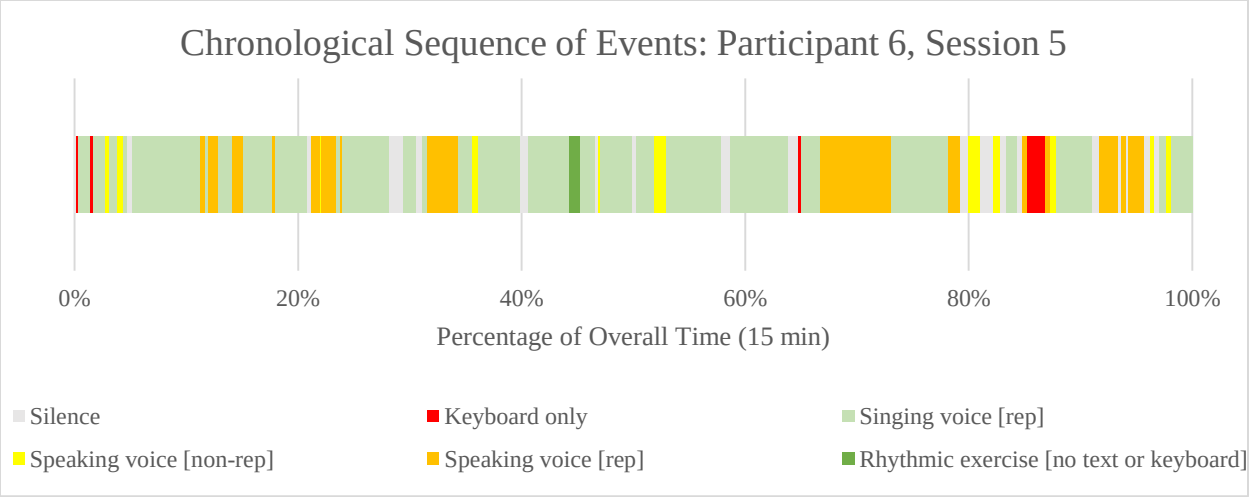

Figure L36. Chronological order of observed behavioral categories: Participant 6, Session 5.

Participant 7. Figure L37 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 7.

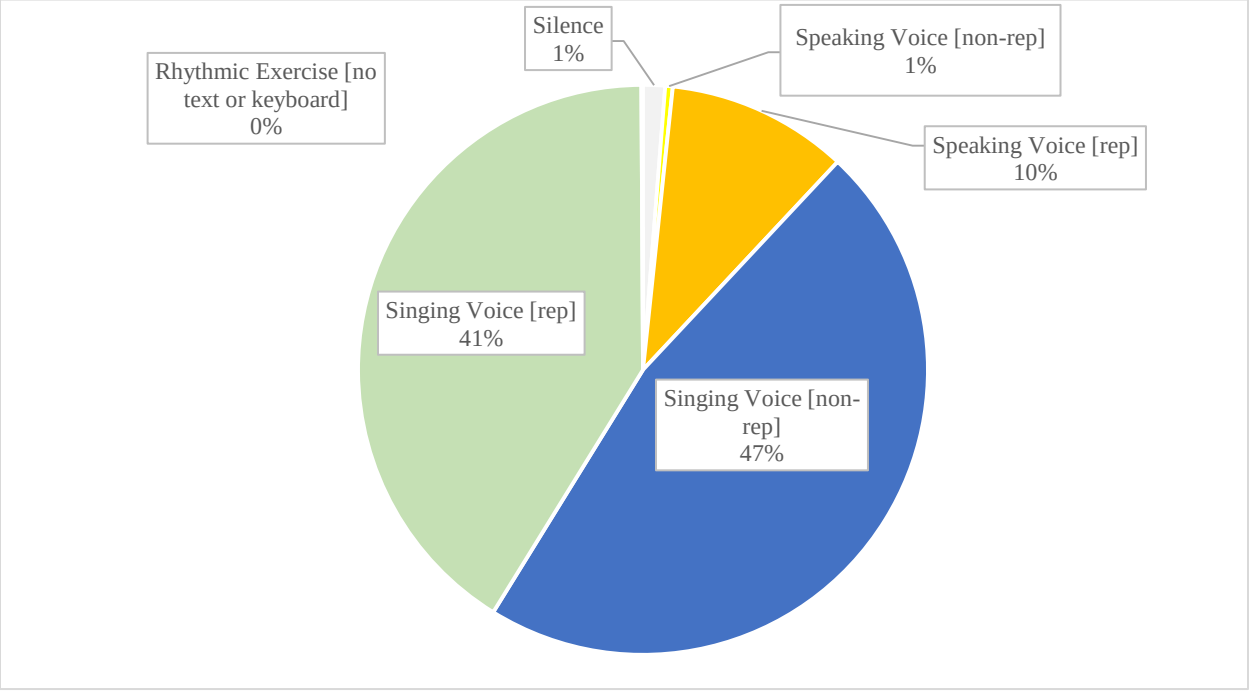

Figure L37. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 7.

Figures L38 – L42 present the chronological order of observed behavioral categories for each individual session by Participant 7.

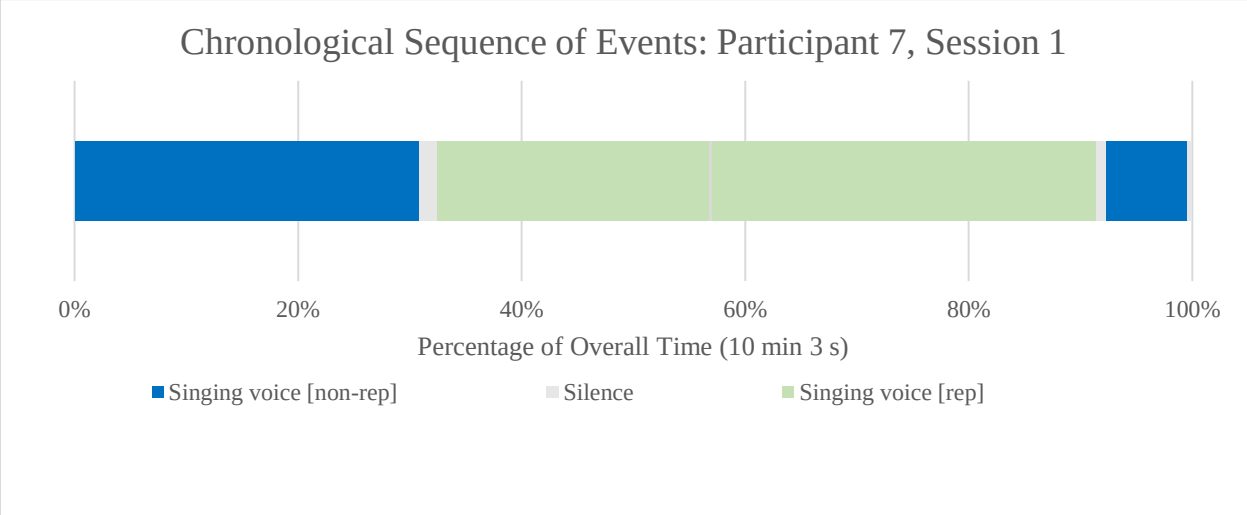

Figure L38. Chronological order of observed behavioral categories: Participant 7, Session 1.

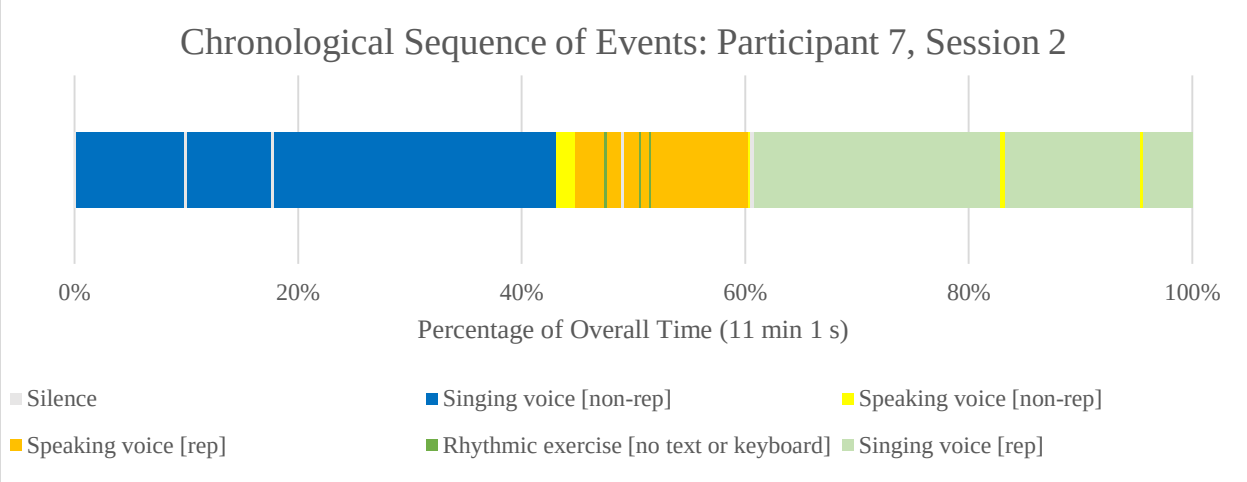

Figure L39. Chronological order of observed behavioral categories: Participant 7, Session 2.

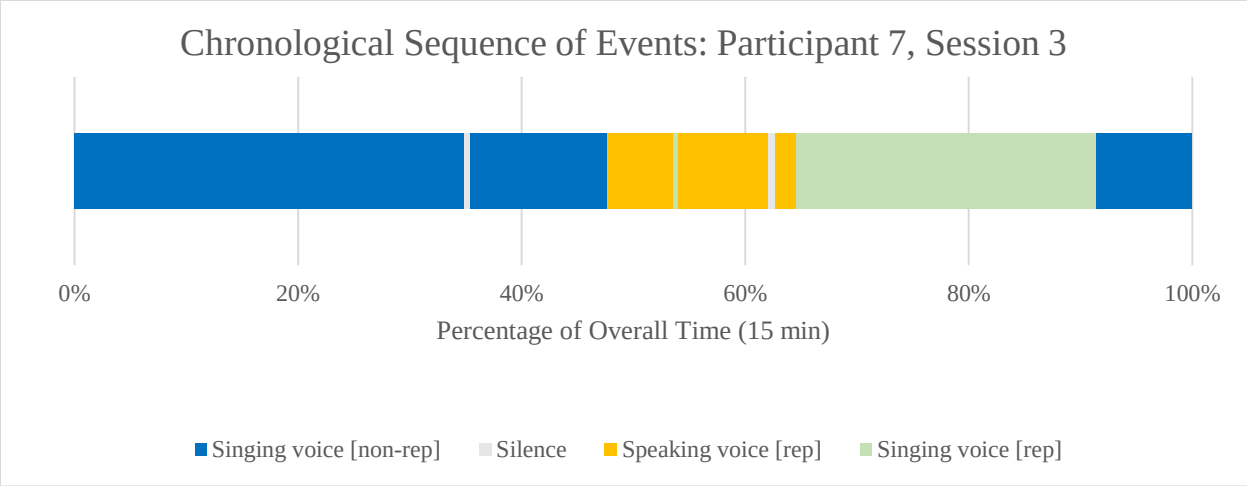

Figure L40. Chronological order of observed behavioral categories: Participant 7, Session 3.

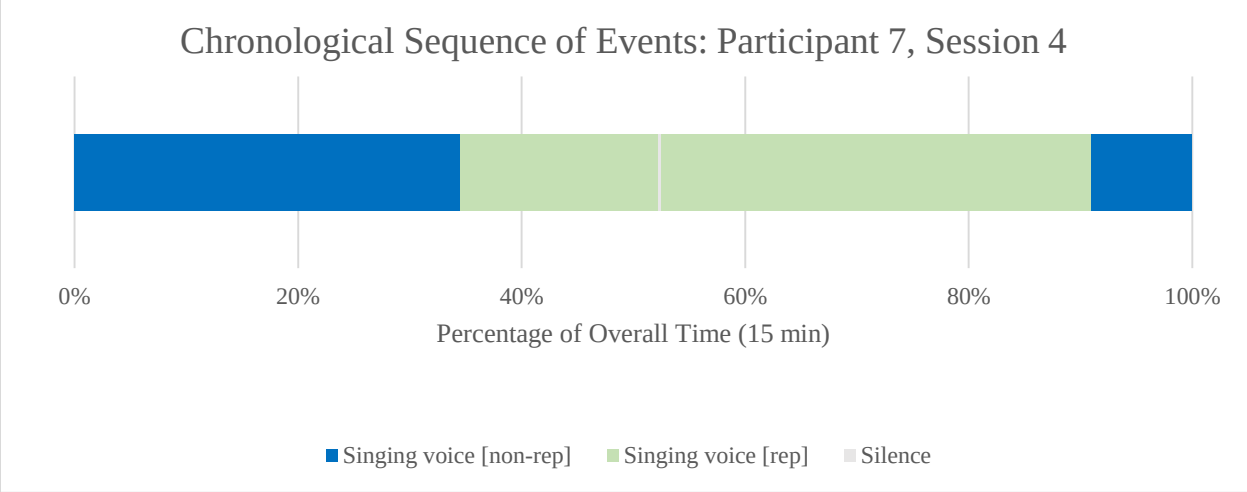

Figure L41. Chronological order of observed behavioral categories: Participant 7, Session 4.

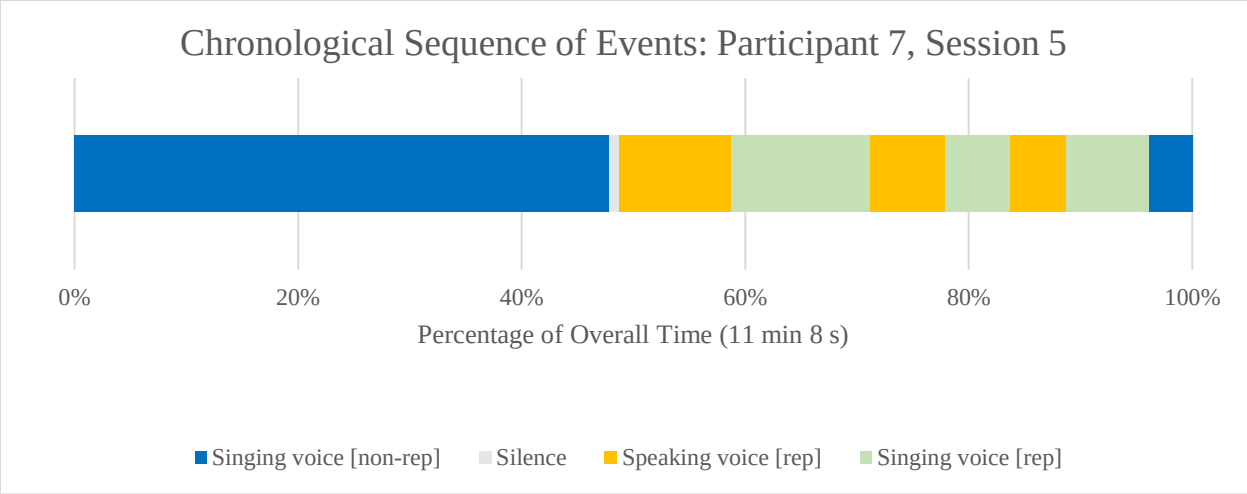

Figure L42. Chronological order of observed behavioral categories: Participant 7, Session 5.

Participant 8. Figure L43 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 8.

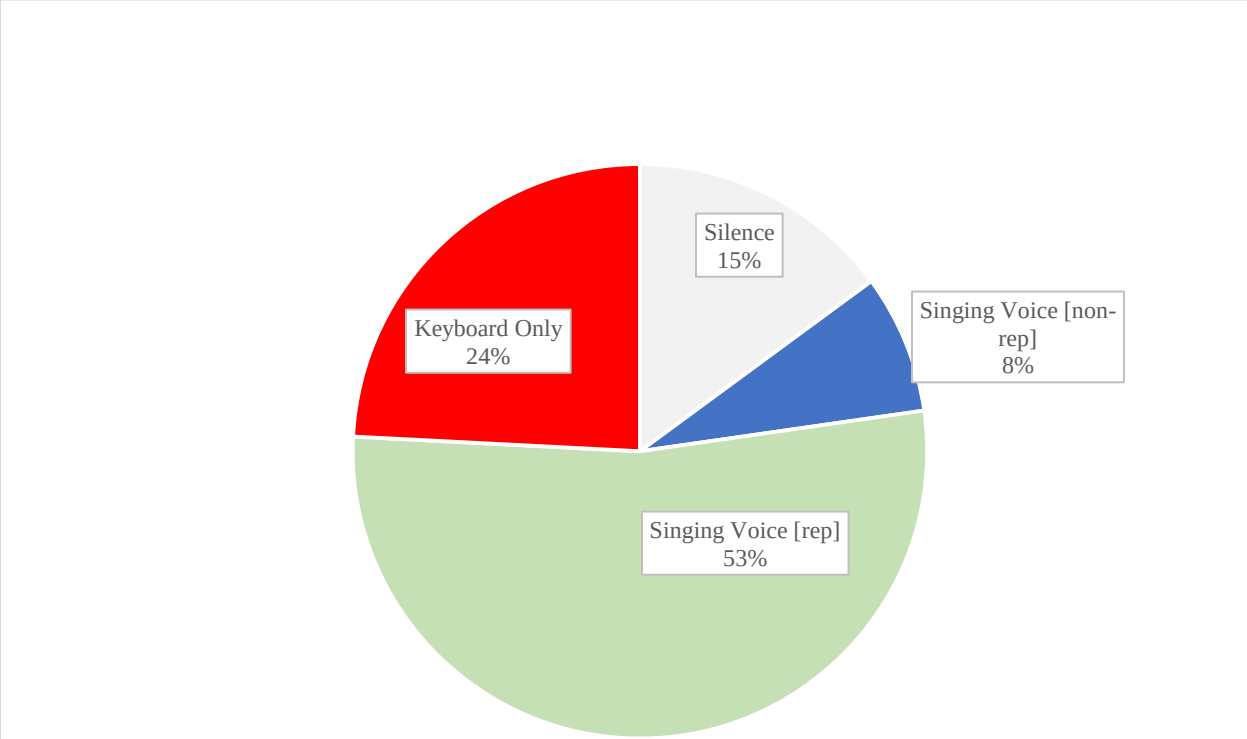

Figure L43. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 8.

Figures L44 – L48 present the chronological order of observed behavioral categories for each individual session by Participant 8.

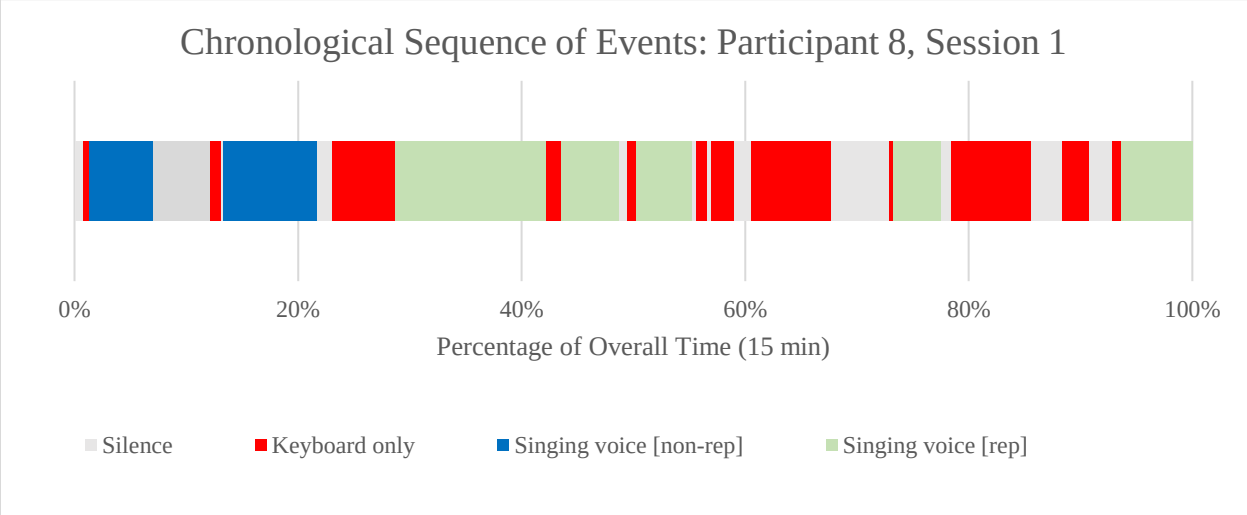

Figure L44. Chronological order of observed behavioral categories: Participant 8, Session 1.

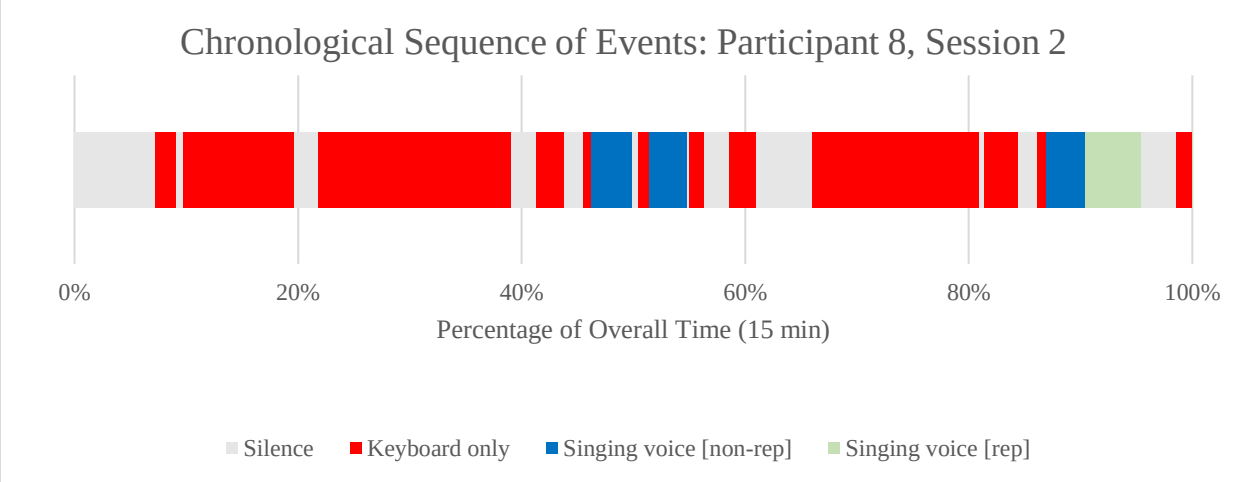

Figure L45. Chronological order of observed behavioral categories: Participant 8, Session 2.

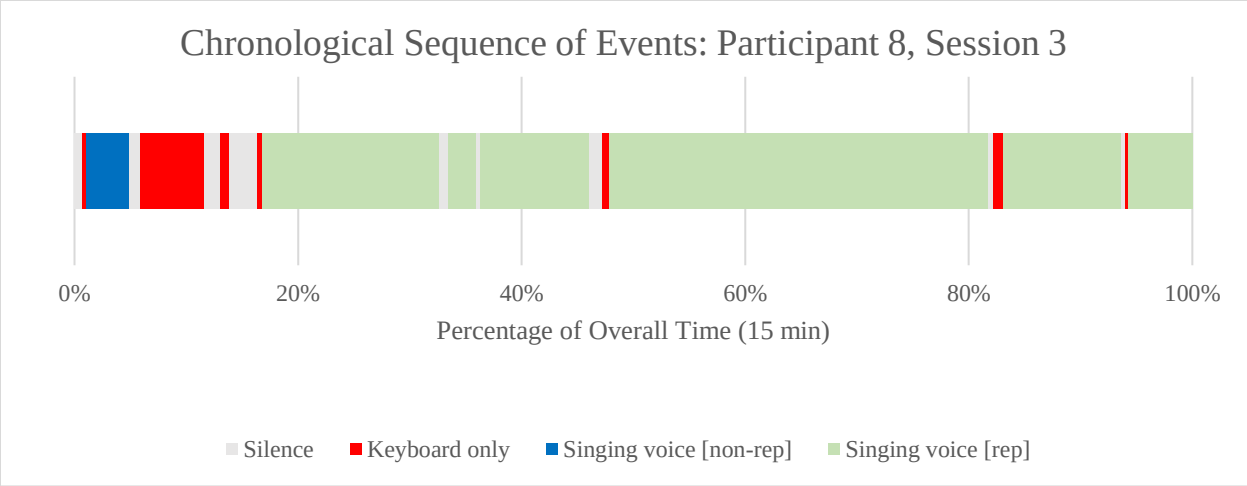

Figure L46. Chronological order of observed behavioral categories: Participant 8, Session 3.

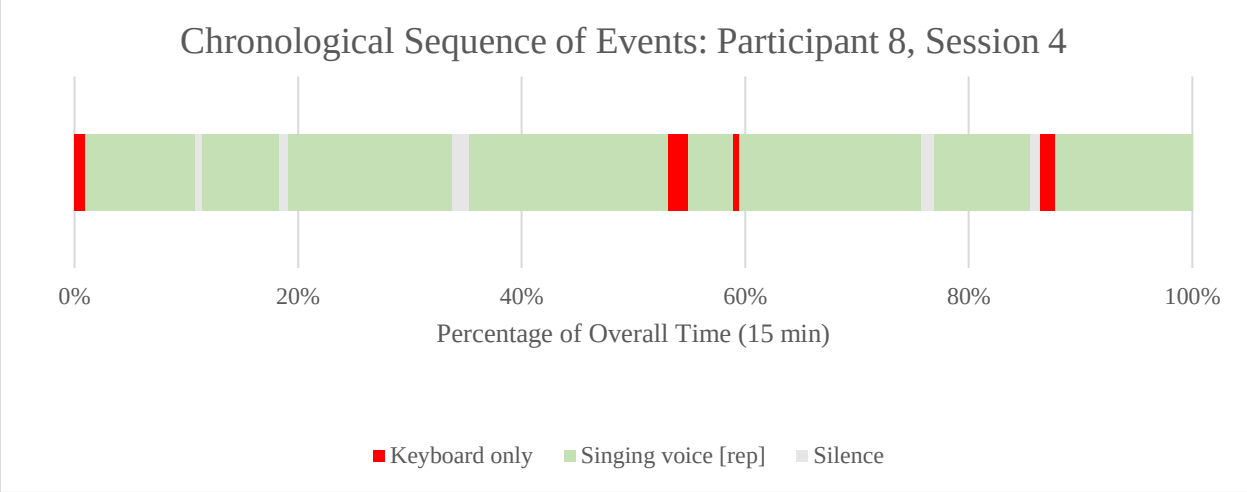

Figure L47. Chronological order of observed behavioral categories: Participant 8, Session 4.

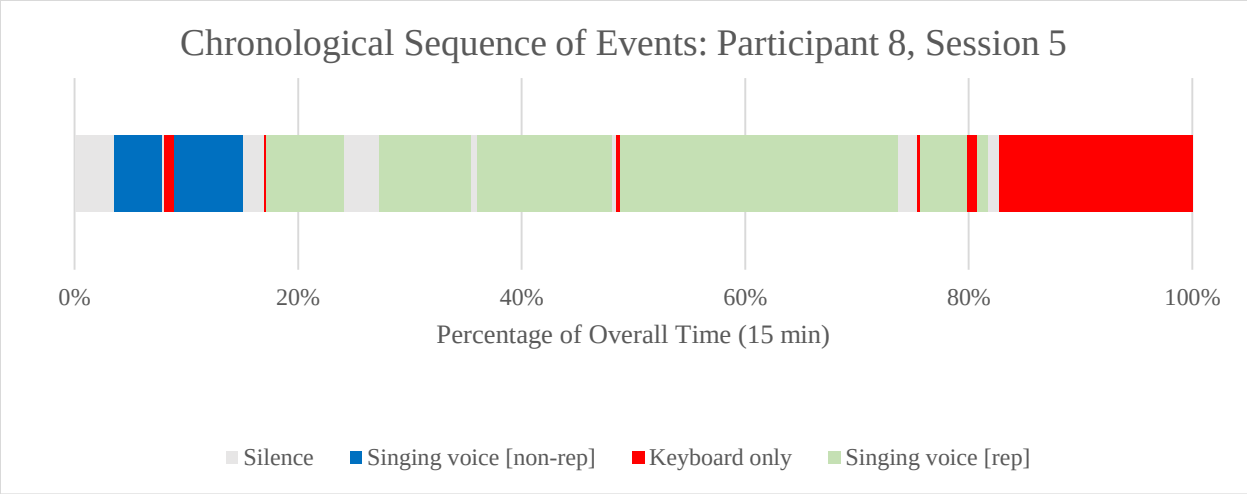

Figure L48. Chronological order of observed behavioral categories: Participant 8, Session 5.

Participant 9. Figure L49 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 9.

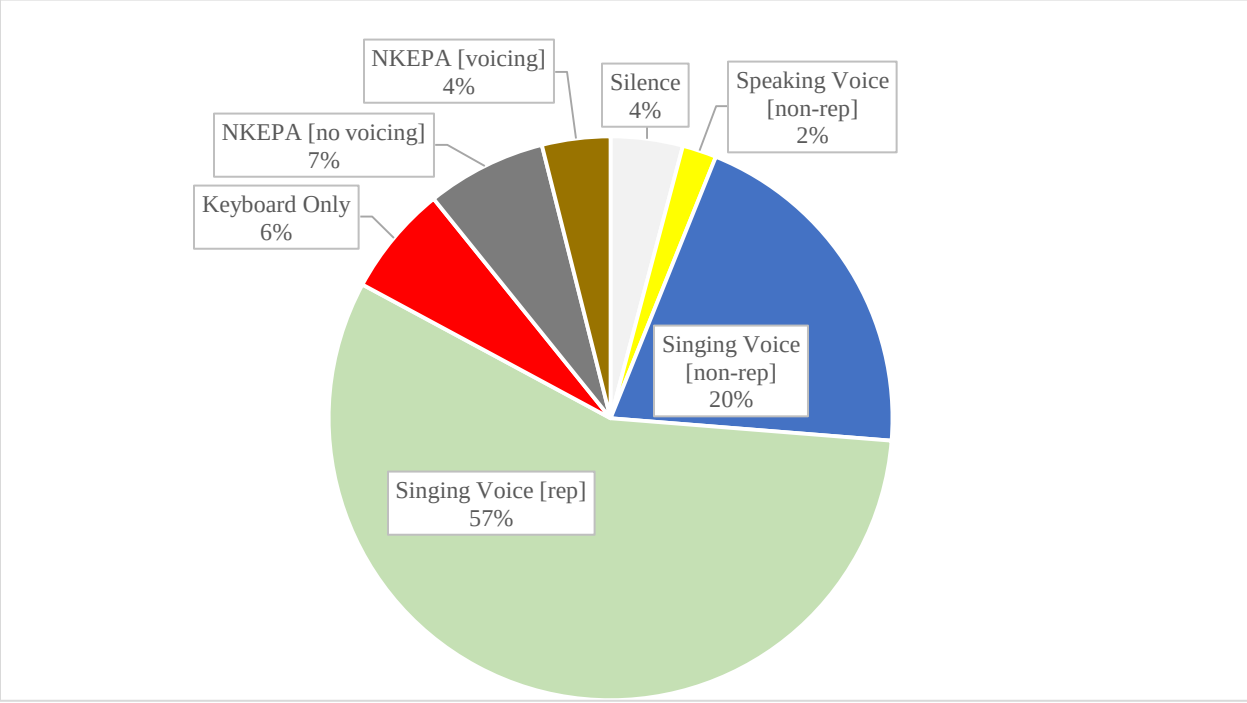

Figure L49. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 9.

Figures L50 – L54 present the chronological order of observed behavioral categories for each individual session by Participant 9. Chronological Sequence of Events: Participant 9, Session 1

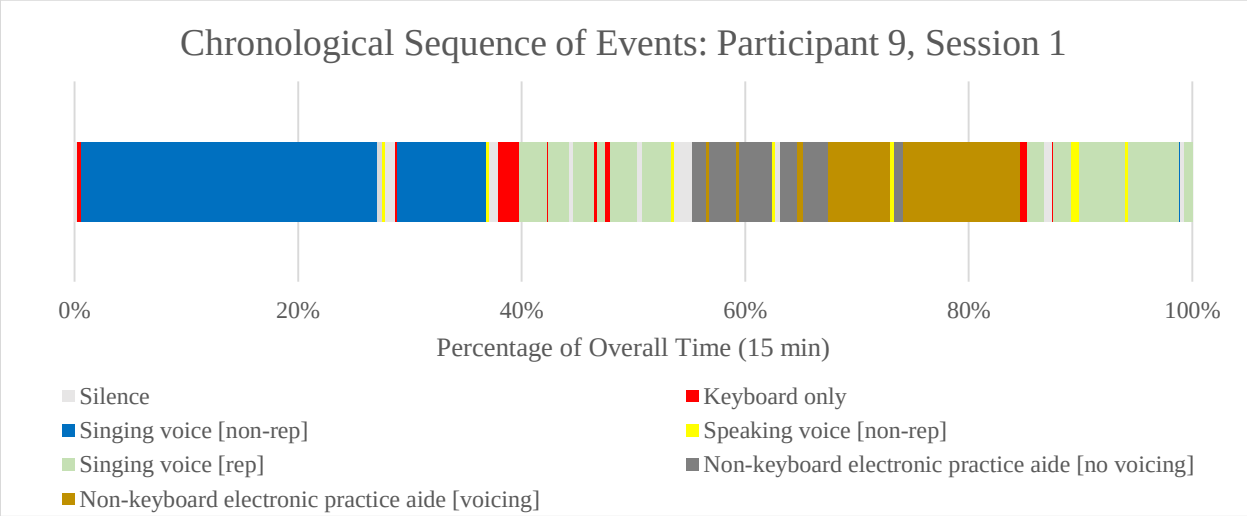

Figure L50. Chronological order of observed behavioral categories: Participant 9, Session 1.

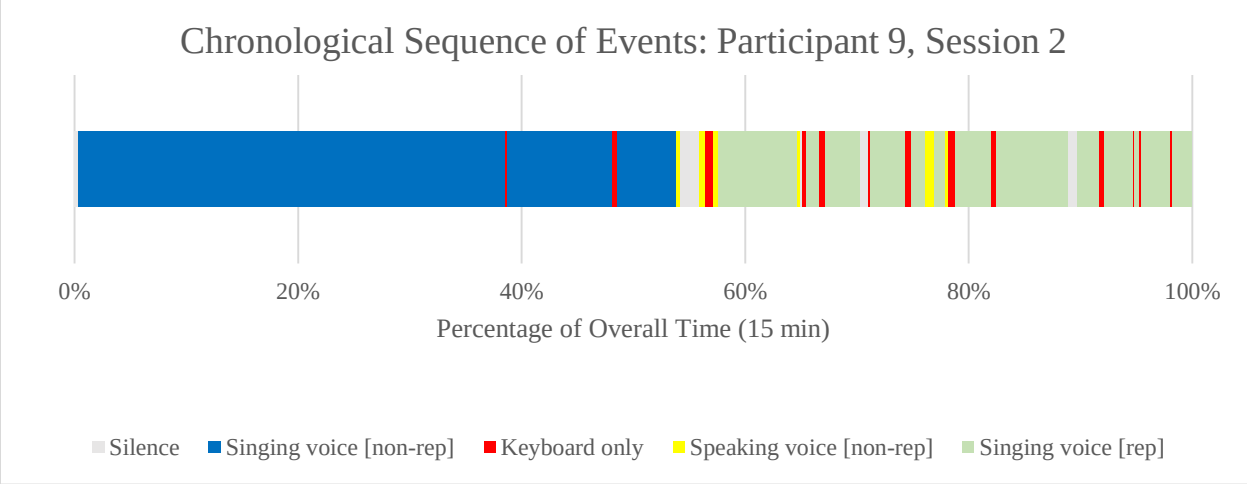

Figure L51. Chronological order of observed behavioral categories: Participant 9, Session 2.

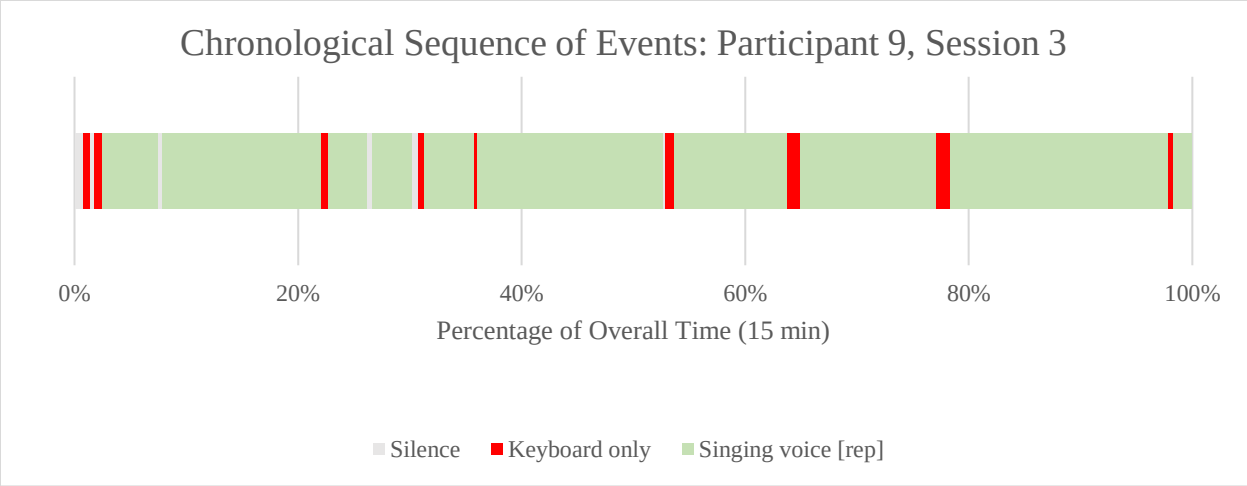

Figure L52. Chronological order of observed behavioral categories: Participant 9, Session 3.

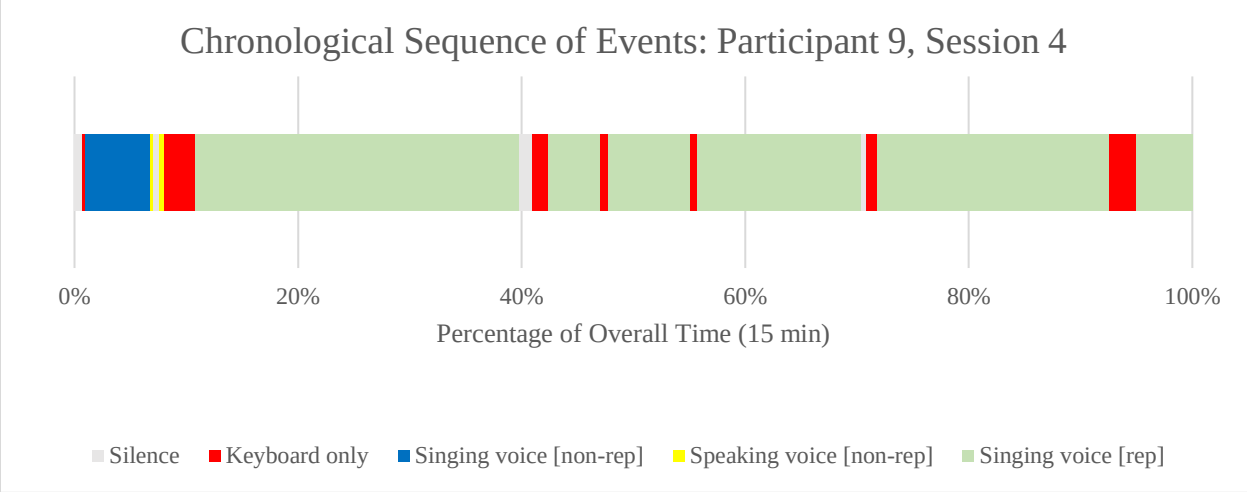

Figure L53. Chronological order of observed behavioral categories: Participant 9, Session 4.

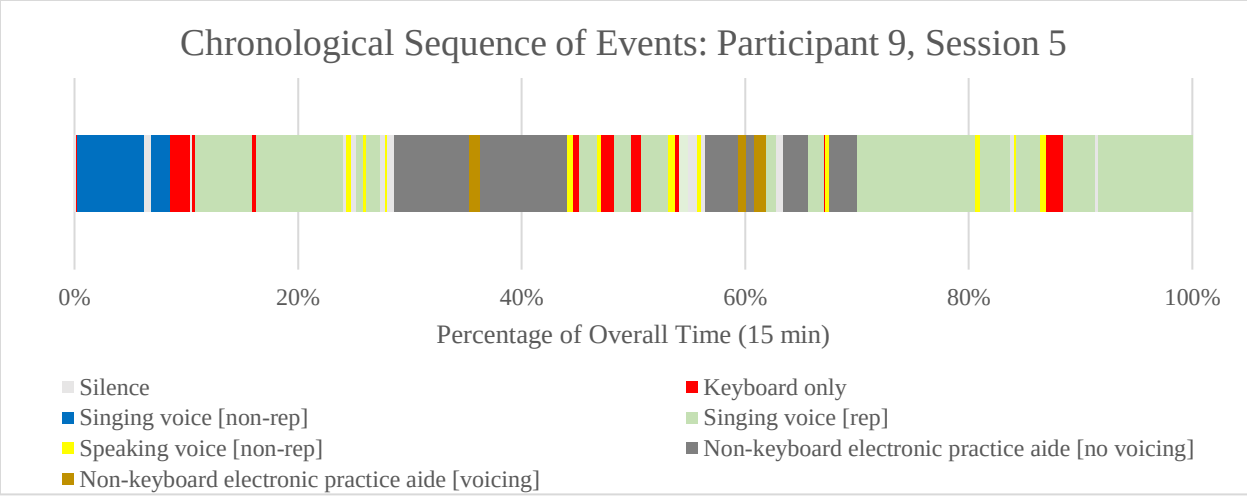

Figure L54. Chronological order of observed behavioral categories: Participant 9, Session 5.

Participant 10. Figure L55 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 10.

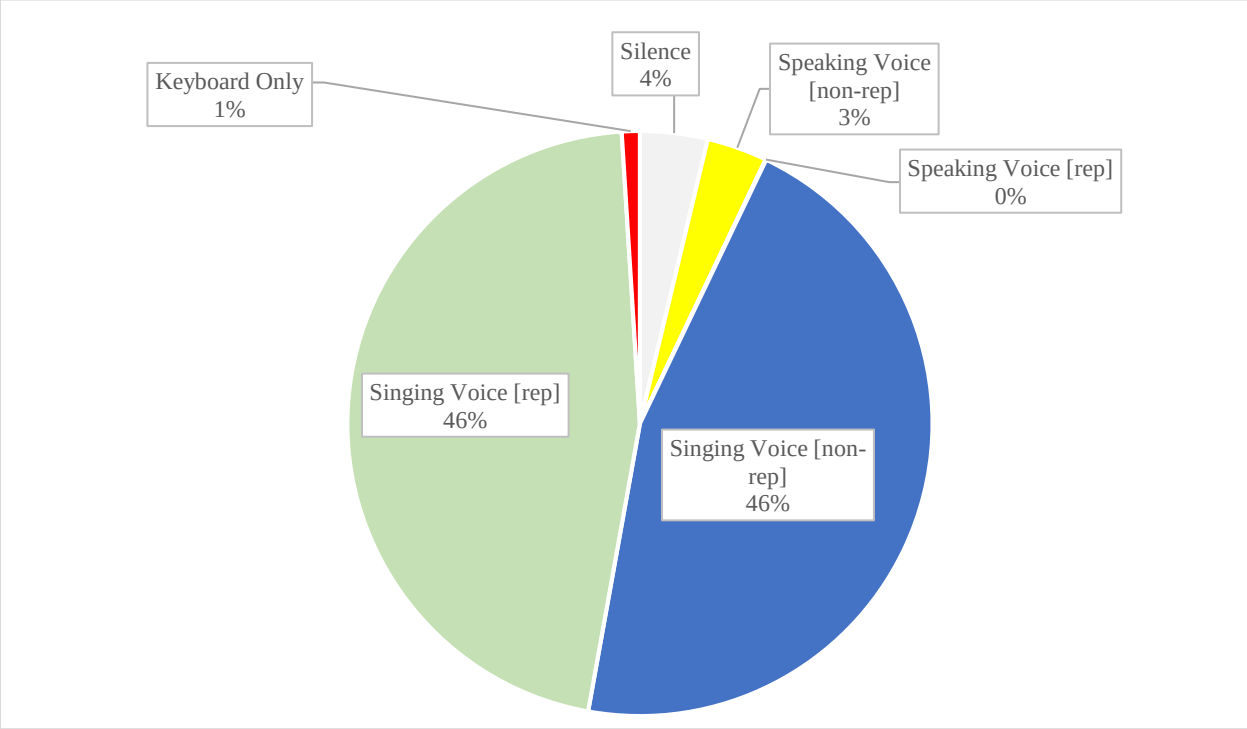

Figure L55. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 10.

Figures L56 – L60 present the chronological order of observed behavioral categories for each individual session by Participant 10.

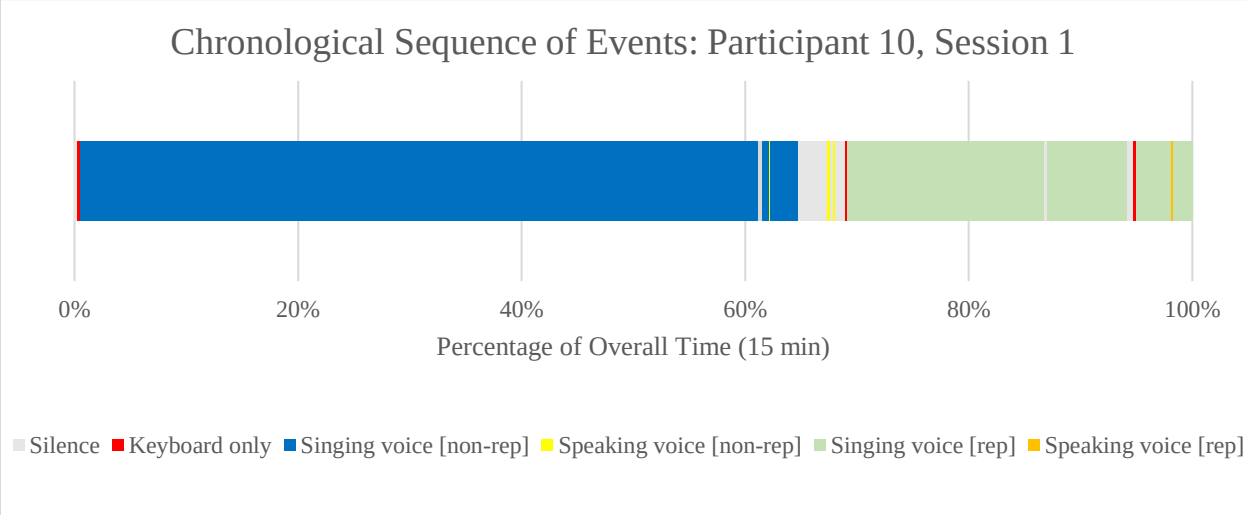

Figure L56. Chronological order of observed behavioral categories: Participant 10, Session 1.

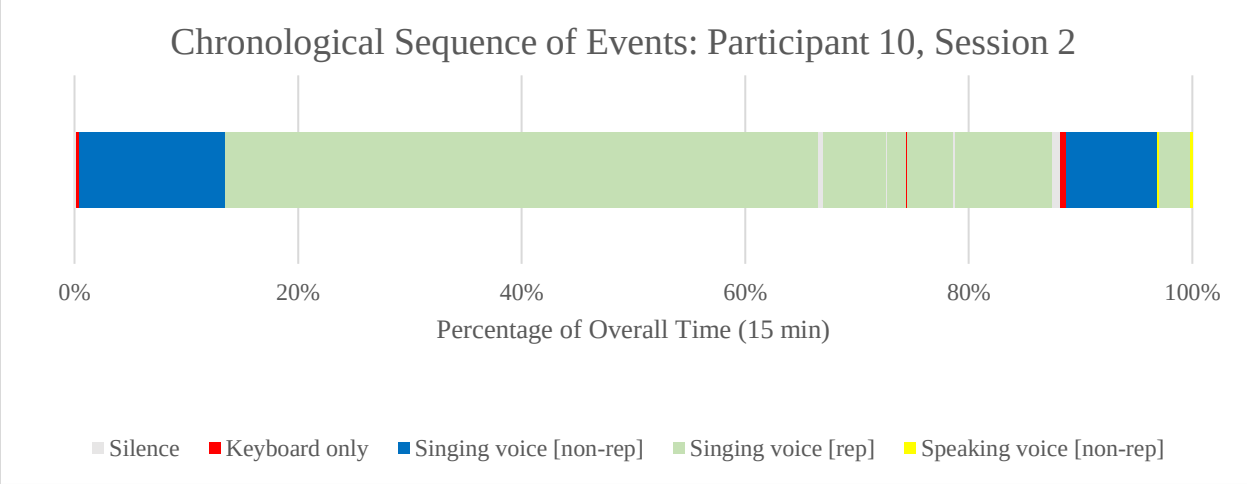

Figure L57. Chronological order of observed behavioral categories: Participant 10, Session 2.

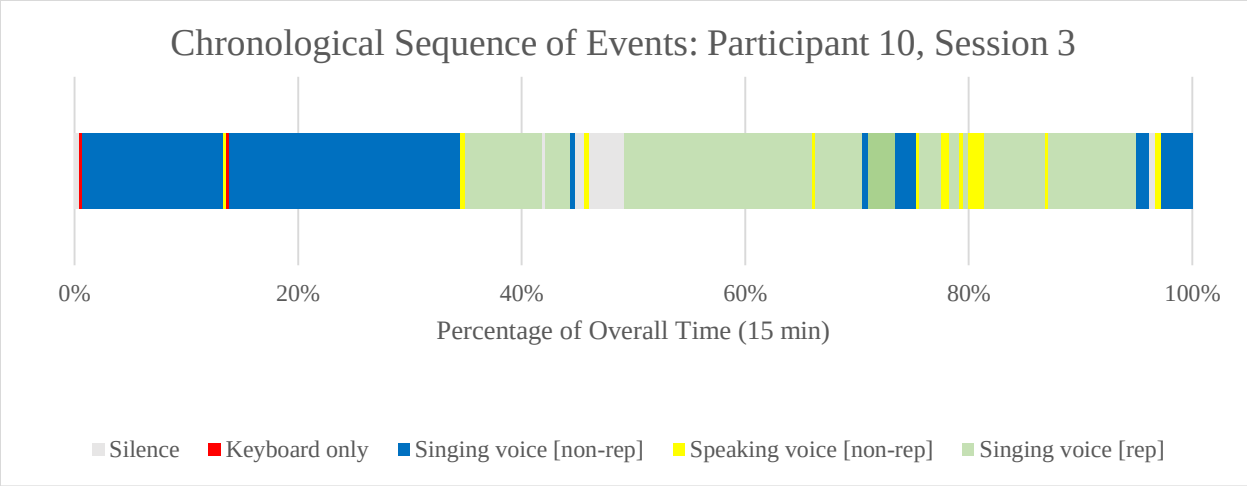

Figure L58. Chronological order of observed behavioral categories: Participant 10, Session 3.

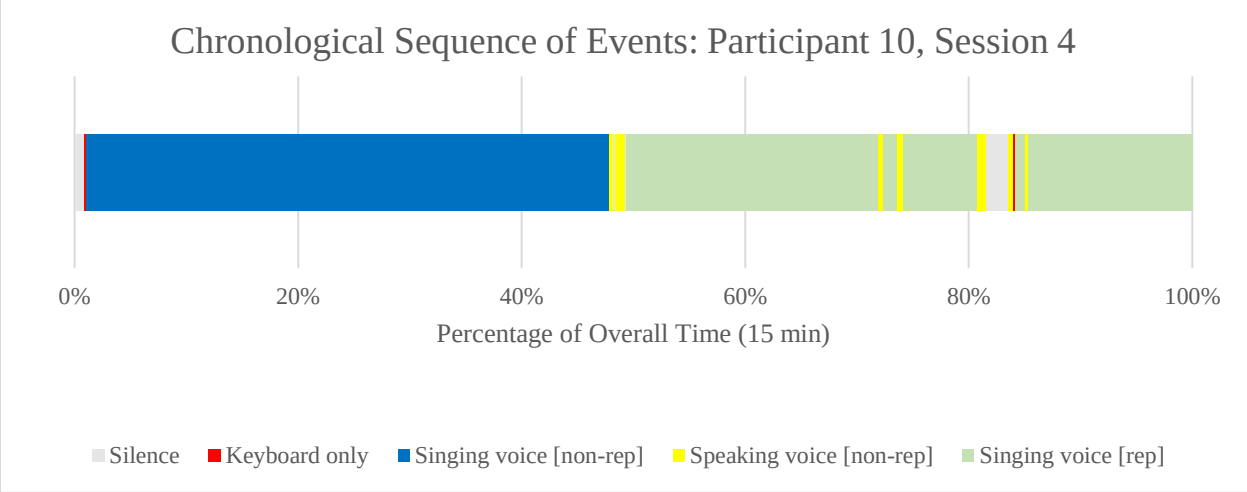

Figure L59. Chronological order of observed behavioral categories: Participant 10, Session 4.

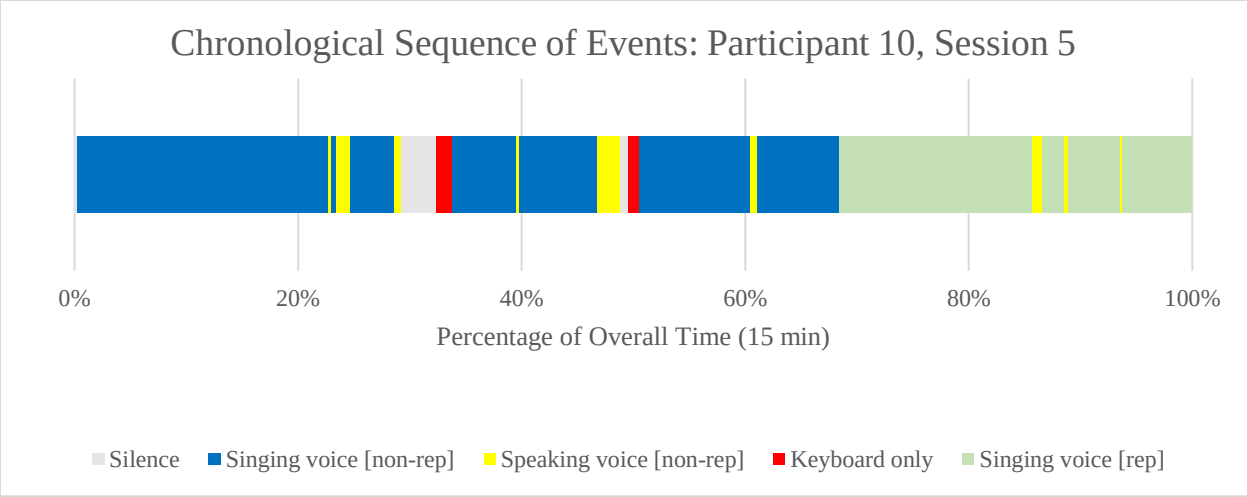

Figure L60. Chronological order of observed behavioral categories: Participant 10, Session 5.

Participant 11. Figure L61 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 11.

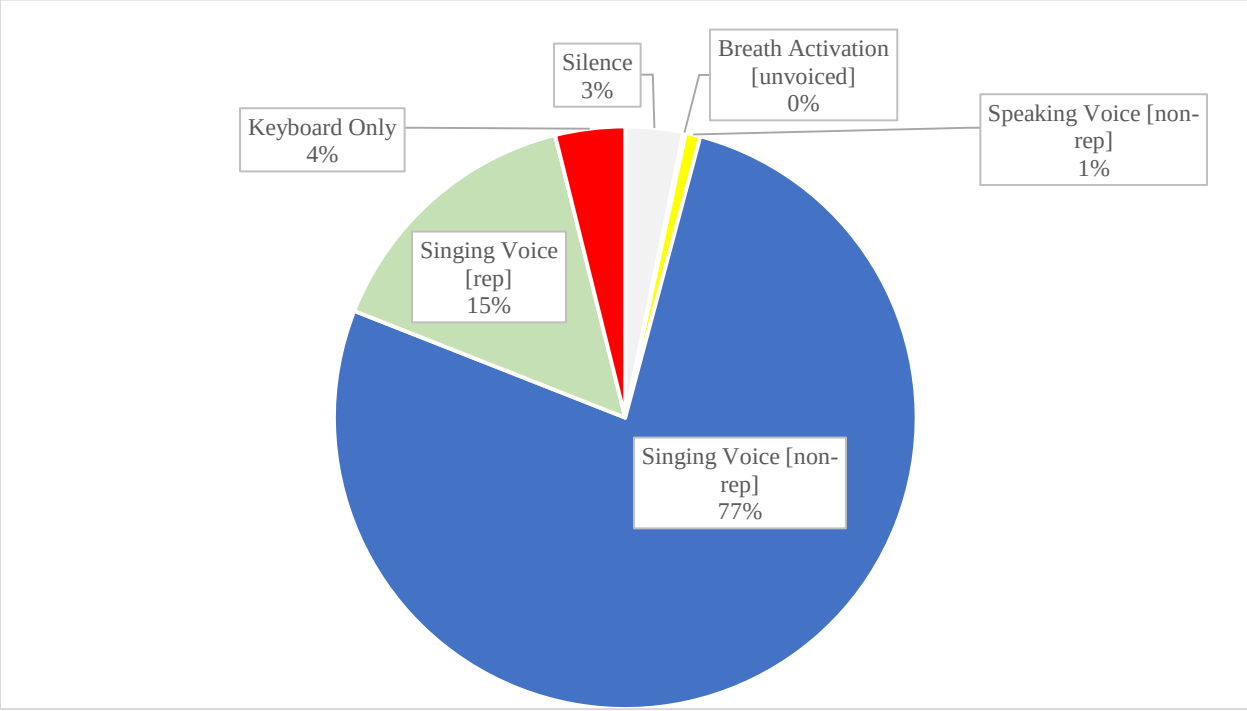

Figure L61. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 11.

Figures L62 – L66 present the chronological order of observed behavioral categories for each individual session by Participant 11.

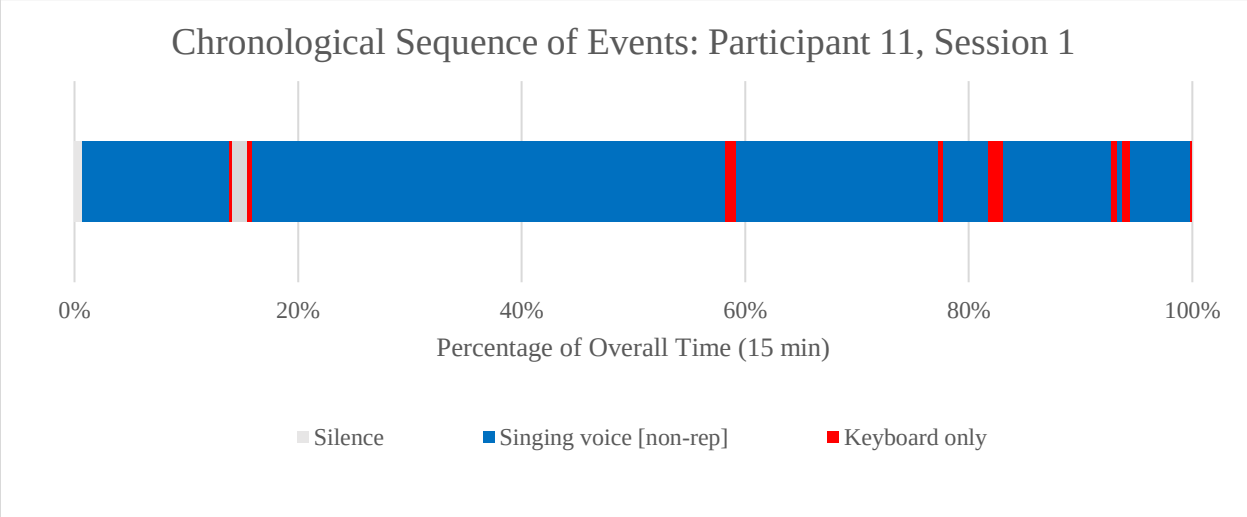

Figure L62. Chronological order of observed behavioral categories: Participant 11, Session 1.

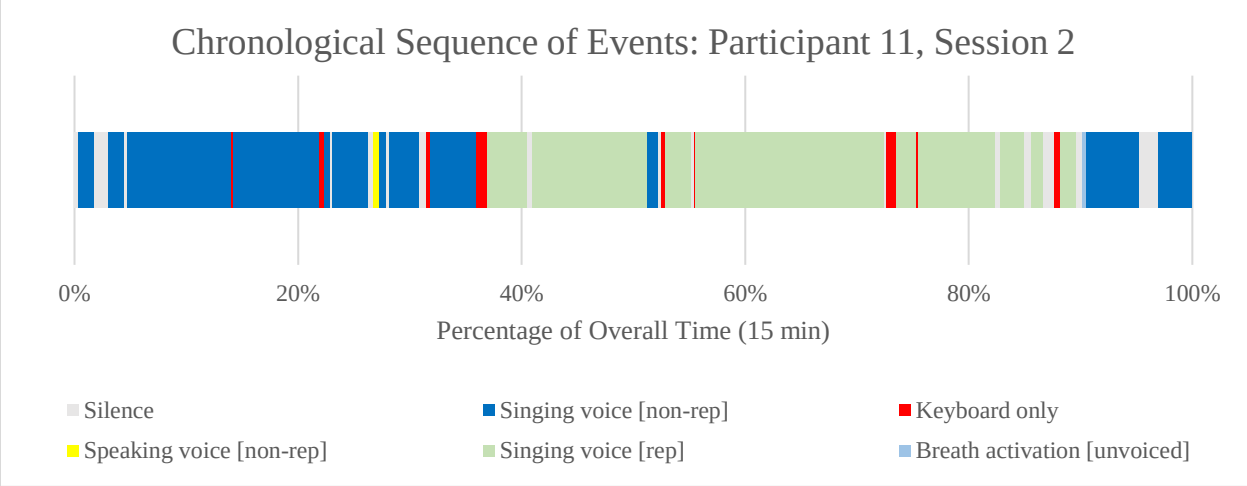

Figure L63. Chronological order of observed behavioral categories: Participant 11, Session 2.

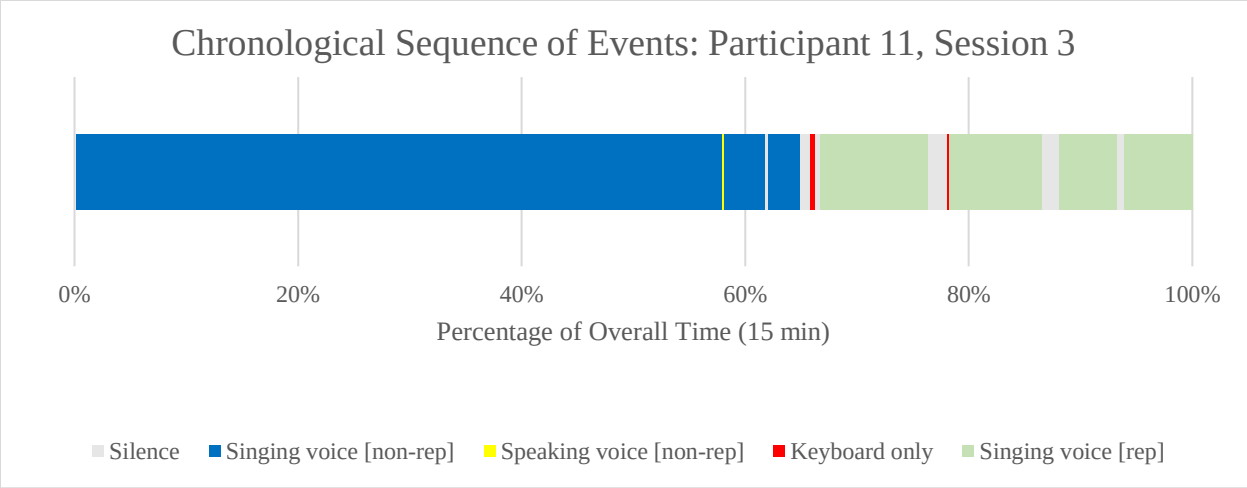

Figure L64. Chronological order of observed behavioral categories: Participant 11, Session 3.

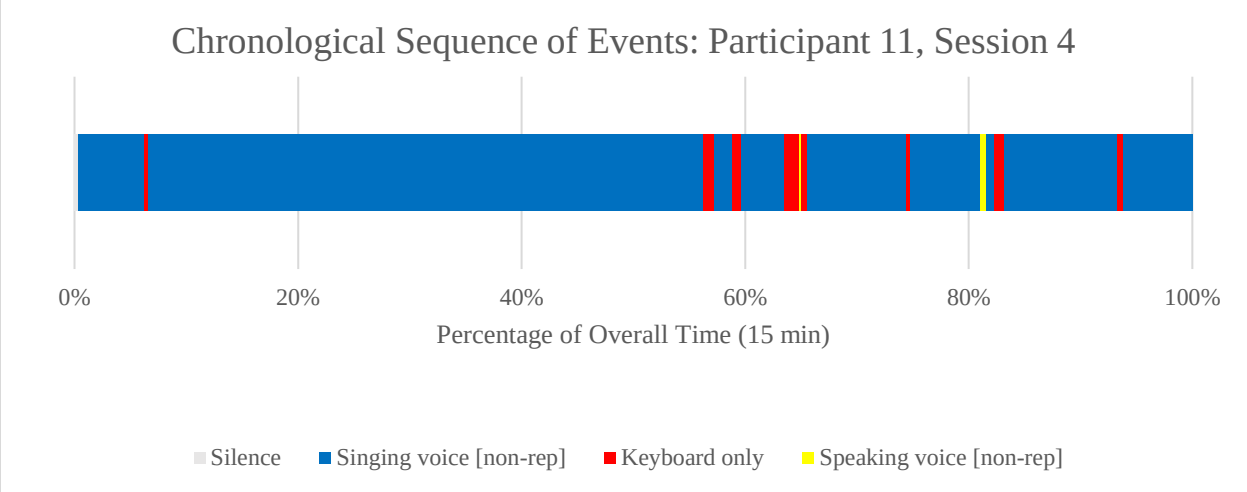

Figure L65. Chronological order of observed behavioral categories: Participant 11, Session 4.

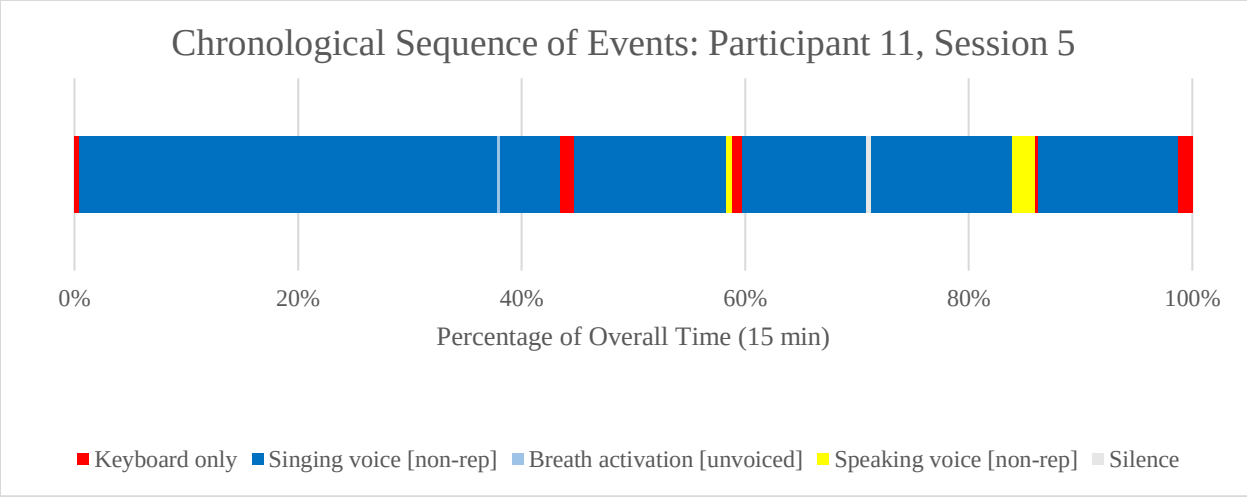

Figure L66. Chronological order of observed behavioral categories: Participant 11, Session 5.

Participant 12. Figure L67 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 12.

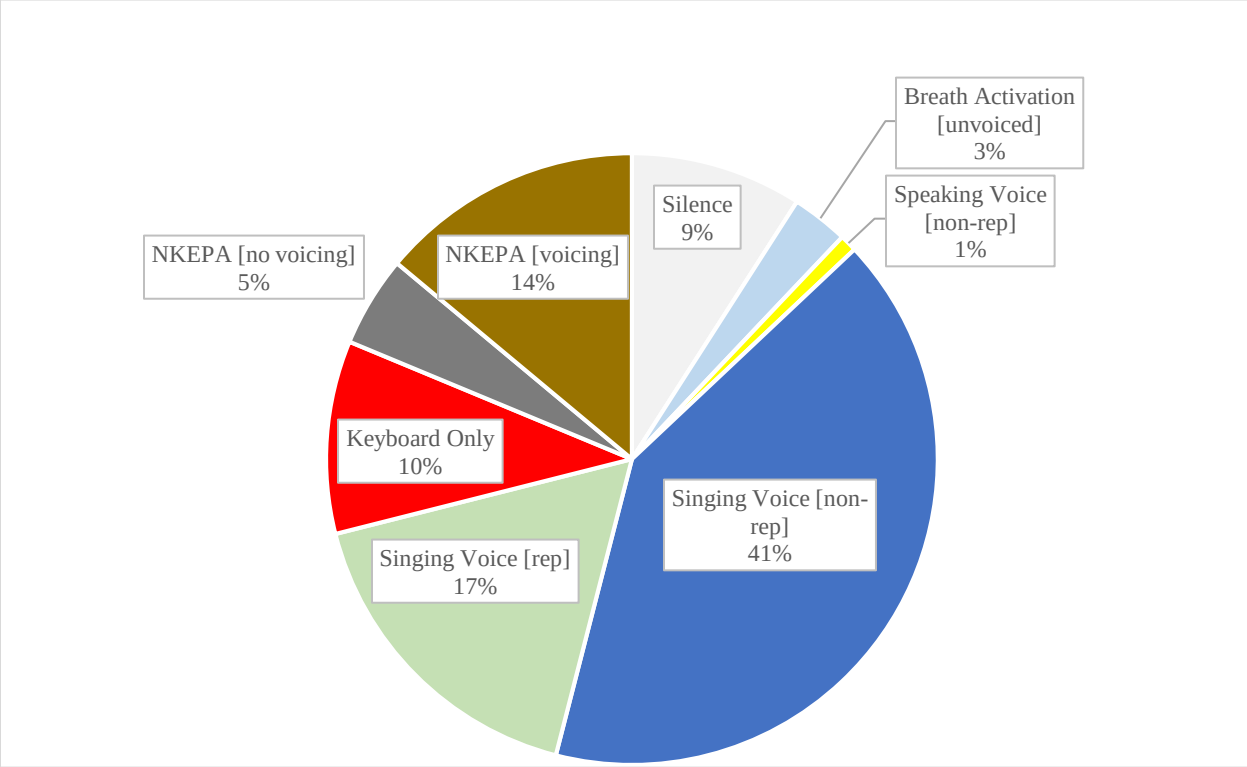

Figure L67. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 12.

Figures L68 – L72 present the chronological order of observed behavioral categories for each individual session by Participant 12.

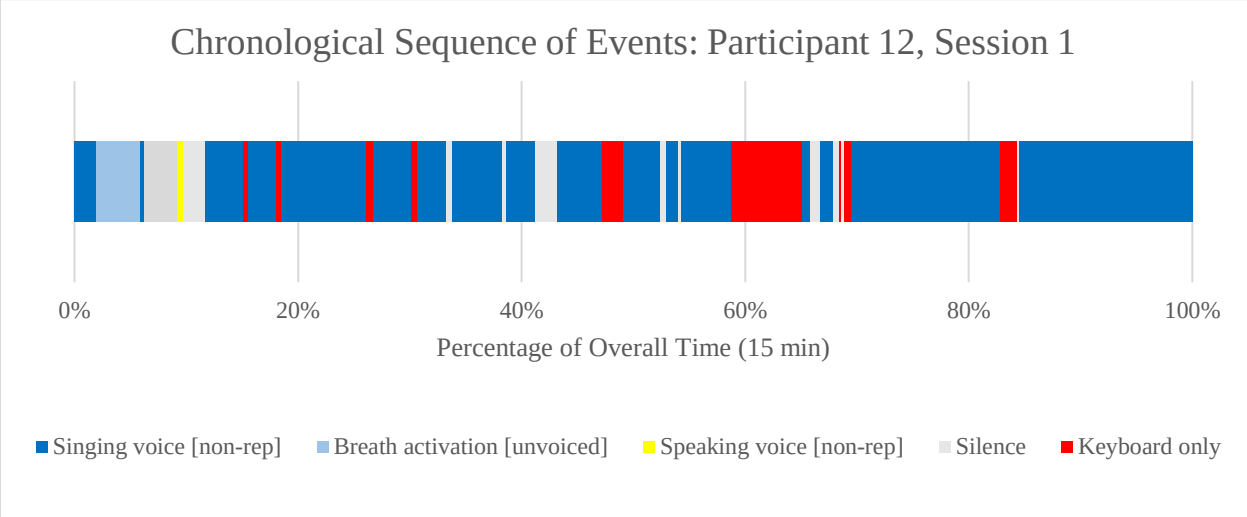

Figure L68. Chronological order of observed behavioral categories: Participant 12, Session 1.

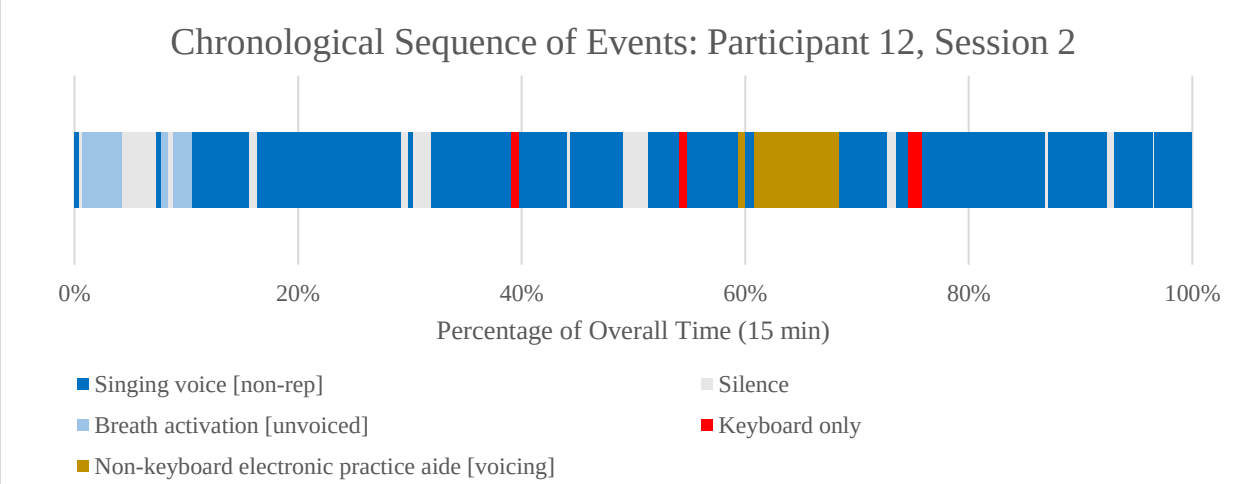

Figure L69. Chronological order of observed behavioral categories: Participant 12, Session 2.

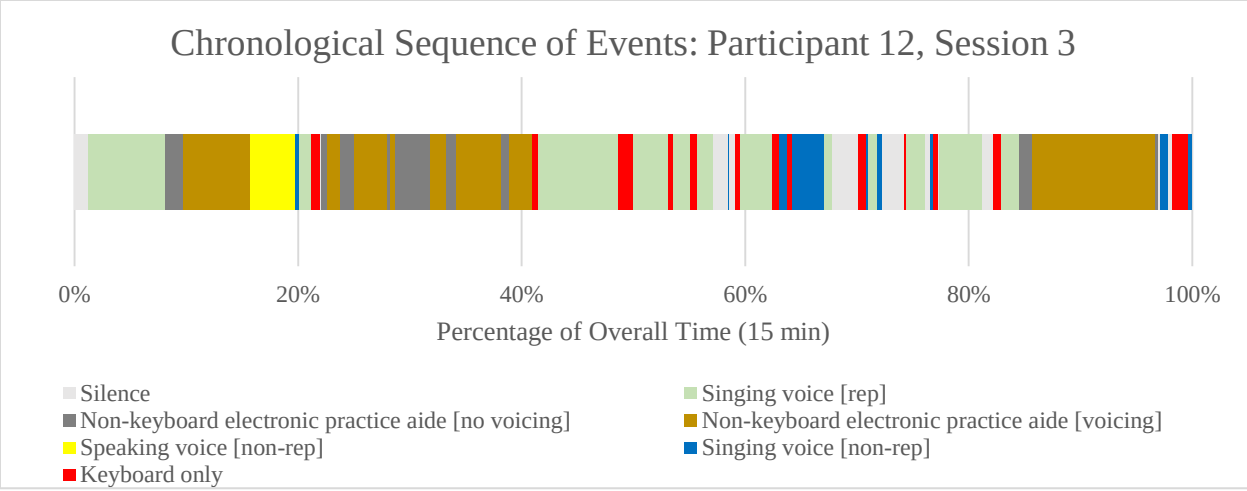

Figure L70. Chronological order of observed behavioral categories: Participant 12, Session 3.

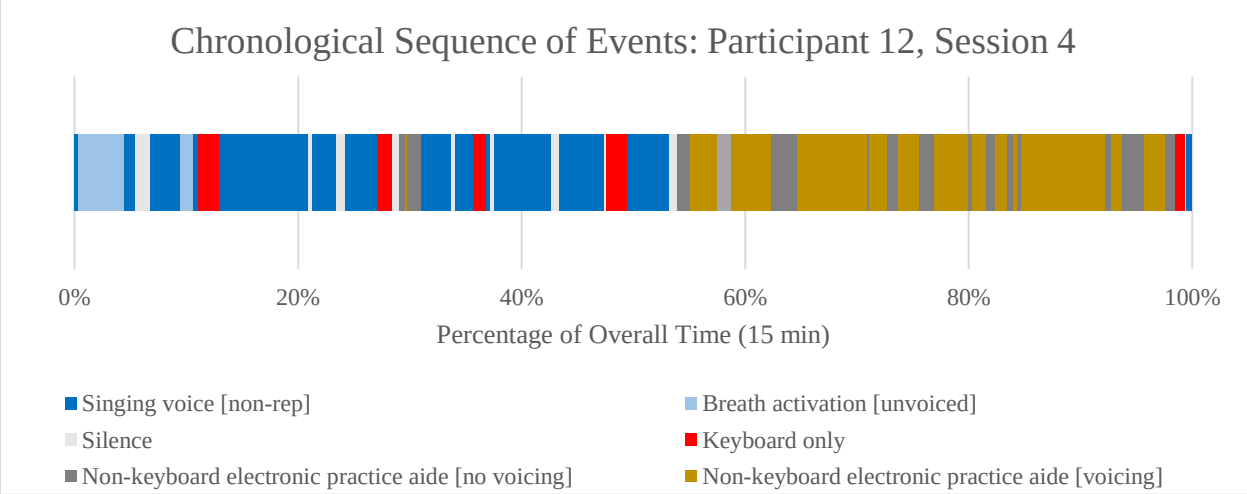

Figure L71. Chronological order of observed behavioral categories: Participant 12, Session 4.

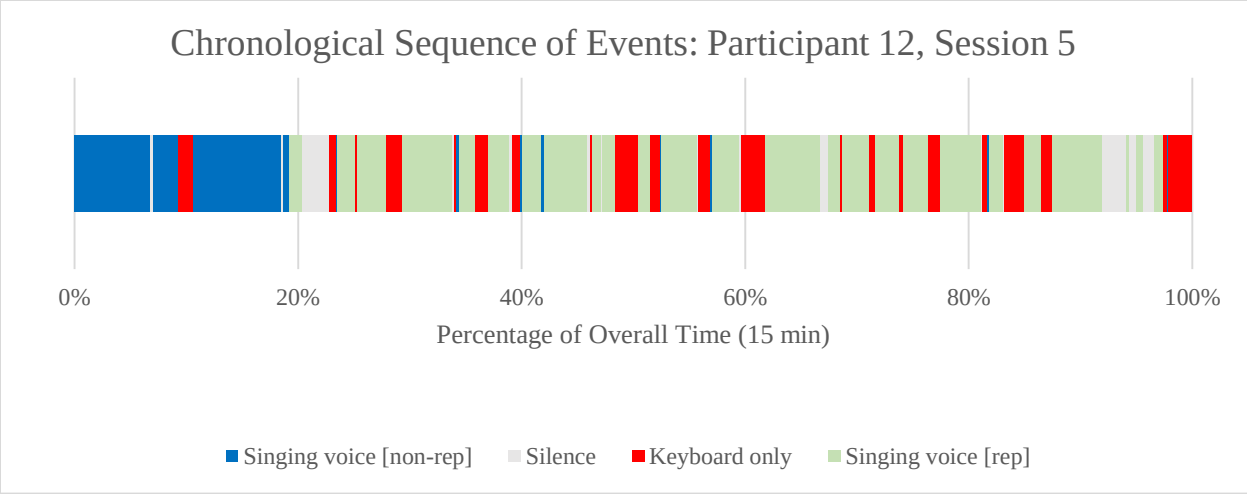

Figure L72. Chronological order of observed behavioral categories: Participant 12, Session 5.

Participant 13. Figure L73 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 13.

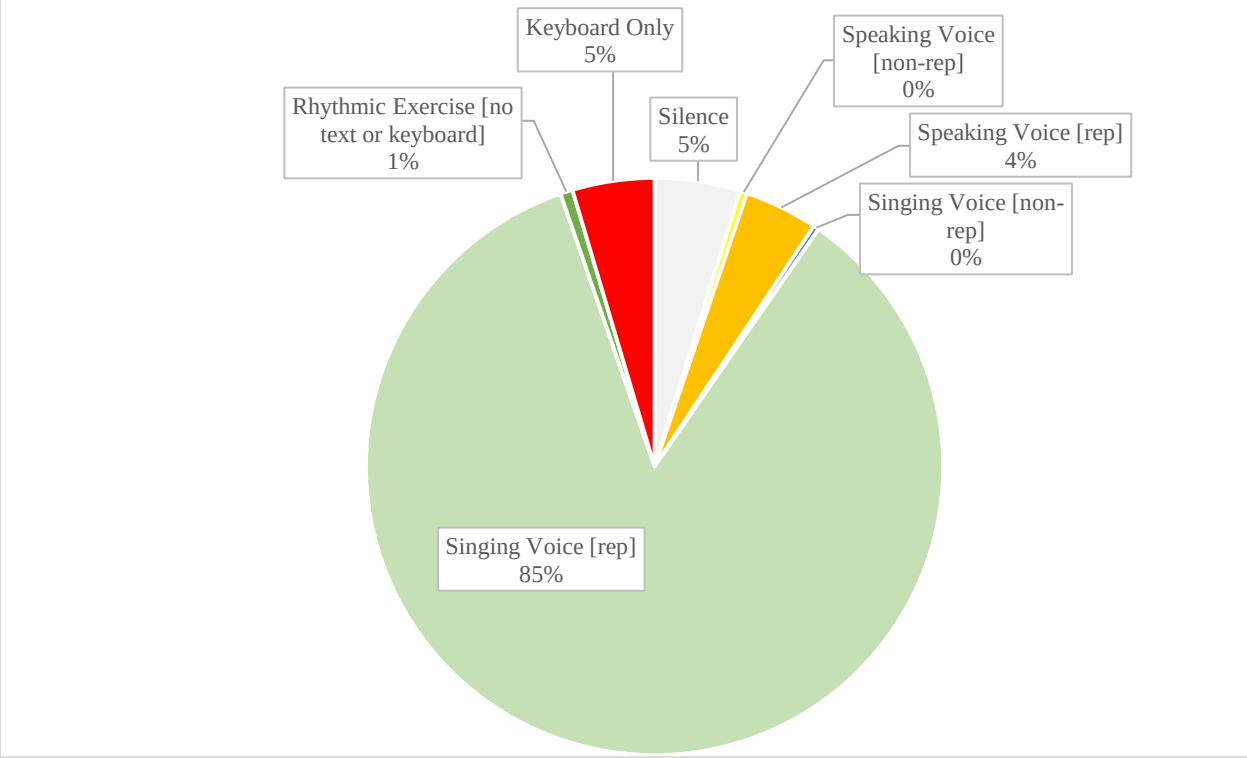

Figure L73. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 13.

Figure L74 – L78 present the chronological order of observed behavioral categories for each individual session by Participant 13.

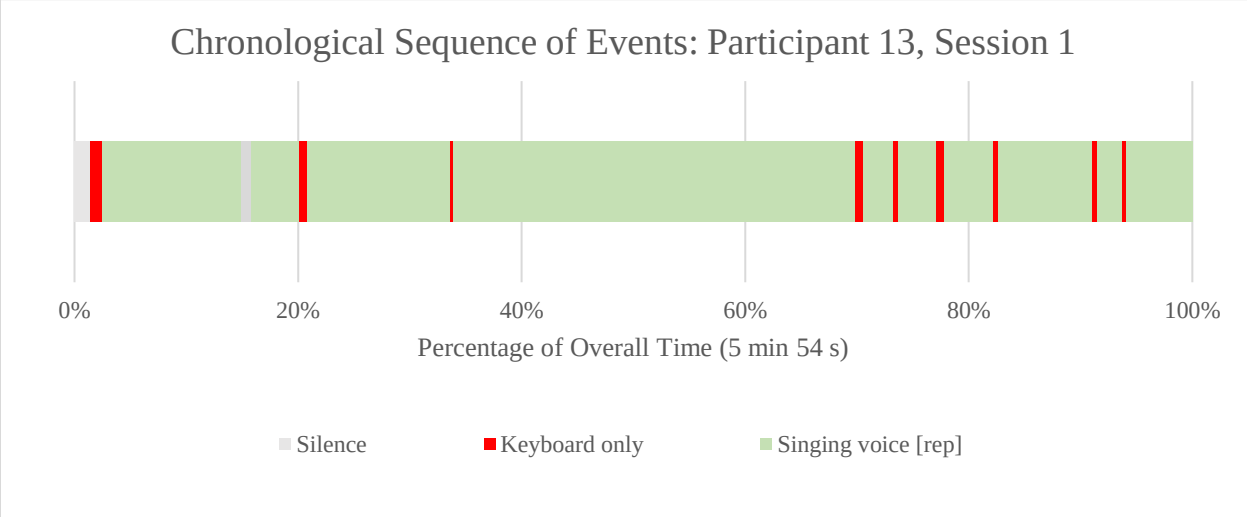

Figure L74. Chronological order of observed behavioral categories: Participant 13, Session 1.

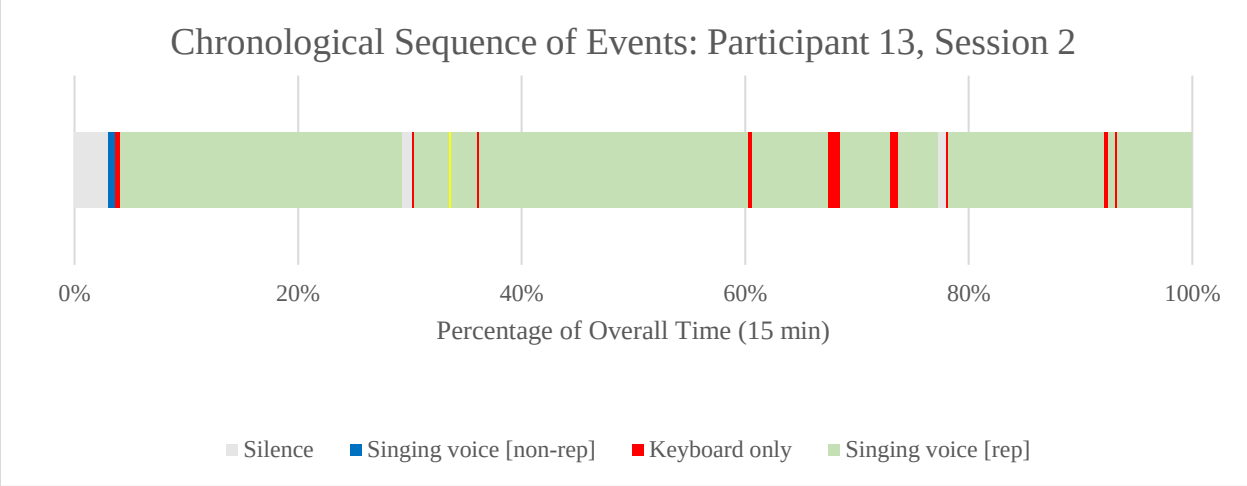

Figure L75. Chronological order of observed behavioral categories: Participant 13, Session 2.

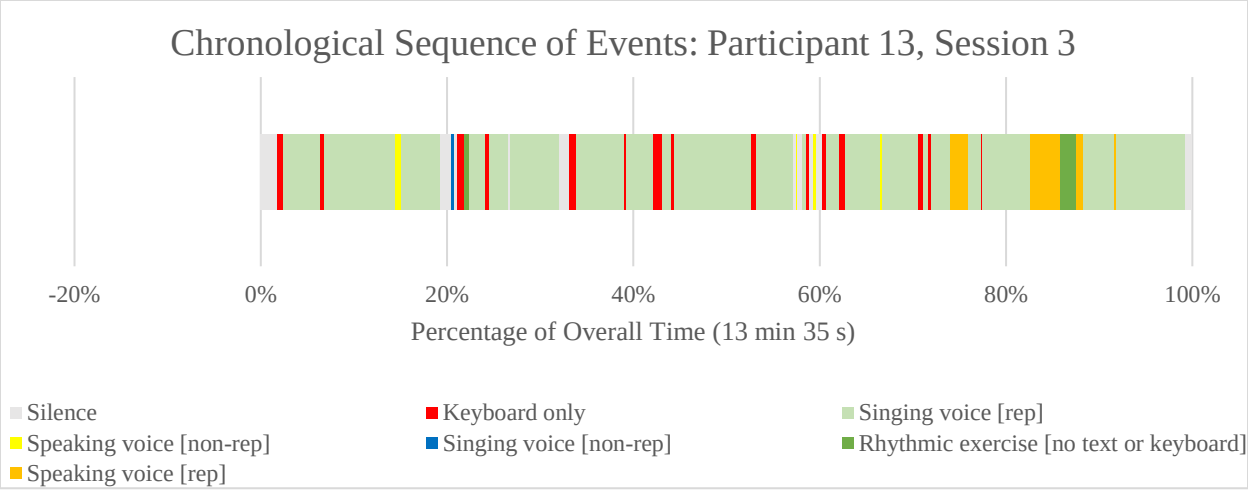

Figure L76. Chronological order of observed behavioral categories: Participant 13, Session 3.

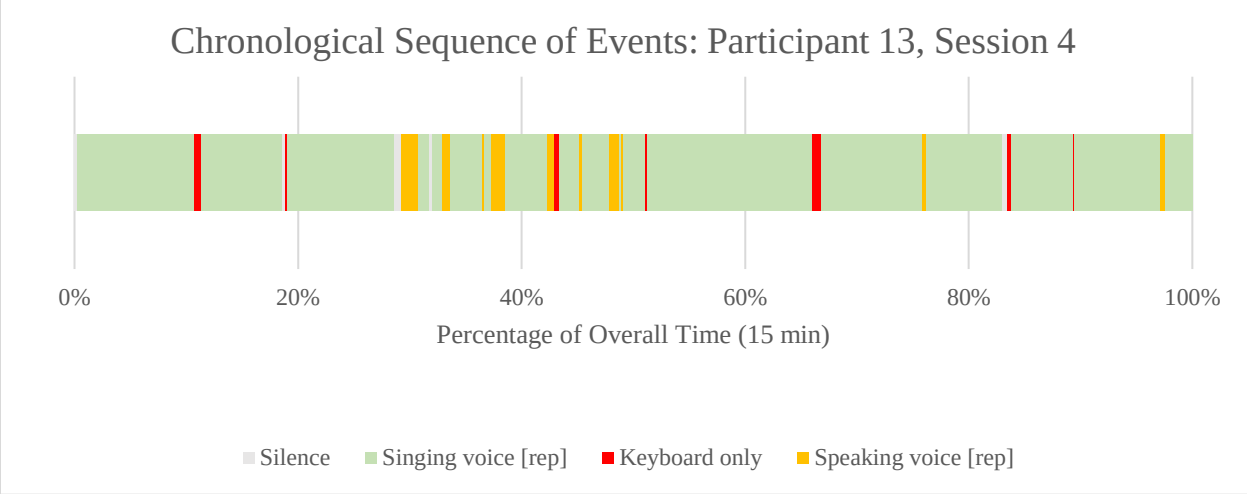

Figure L77. Chronological order of observed behavioral categories: Participant 13, Session 4.

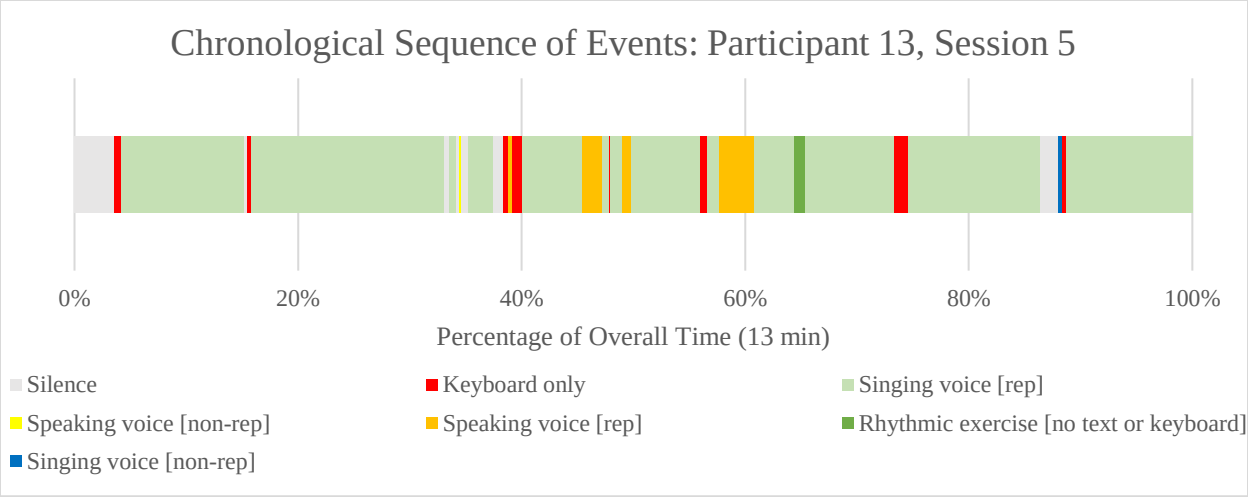

Figure L78. Chronological order of observed behavioral categories: Participant 13, Session 5.

Participant 14. Figure L79 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 14.

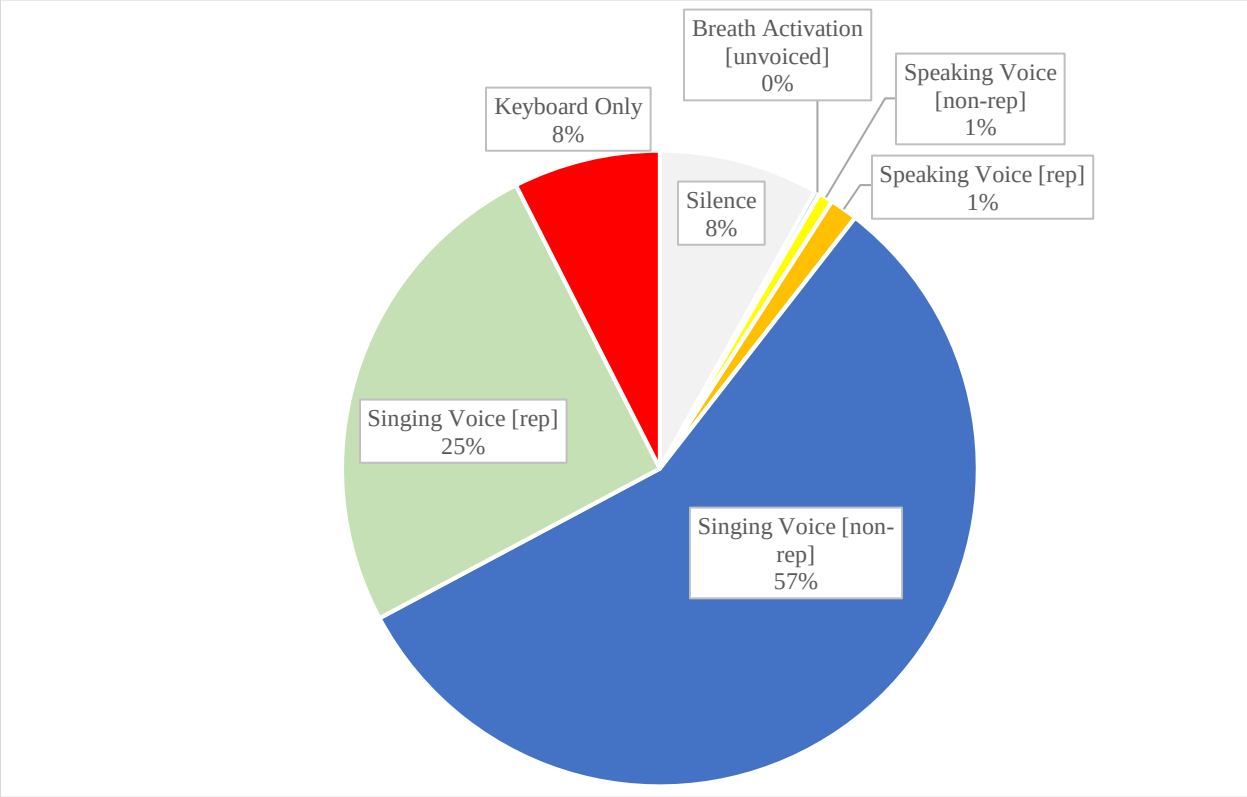

Figure L79. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 14.

Figures L80 – L84 present the chronological order of observed behavioral categories for each individual session by Participant 14.

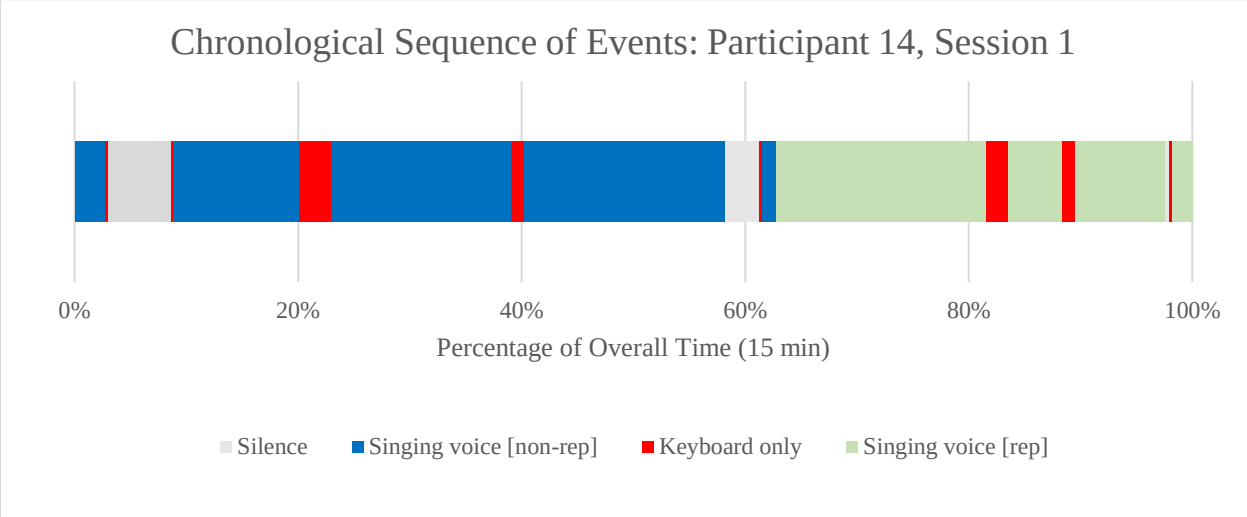

Figure L80. Chronological order of observed behavioral categories: Participant 14, Session 1.

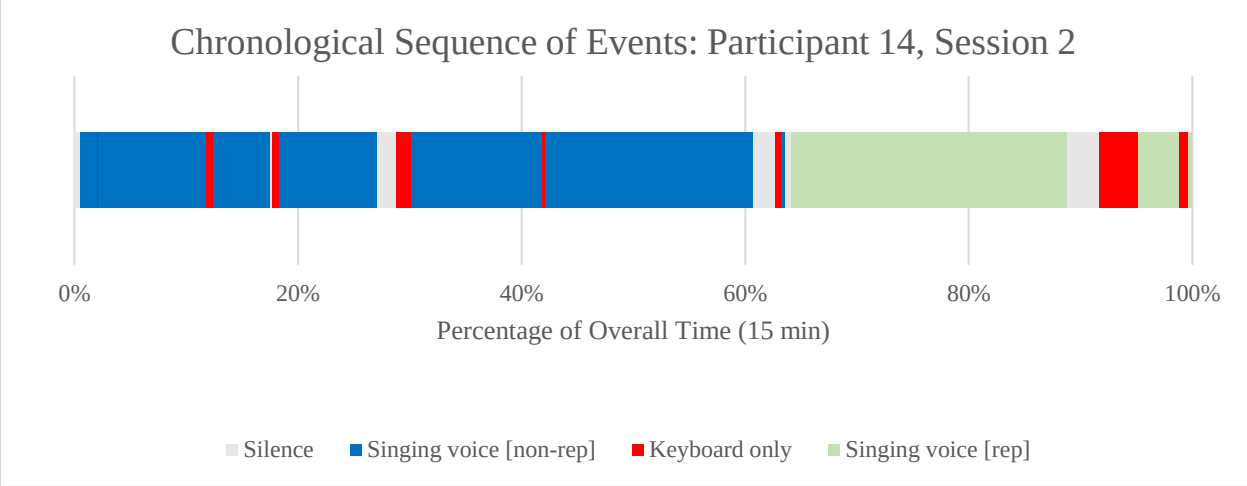

Figure L81. Chronological order of observed behavioral categories: Participant 14, Session 2.

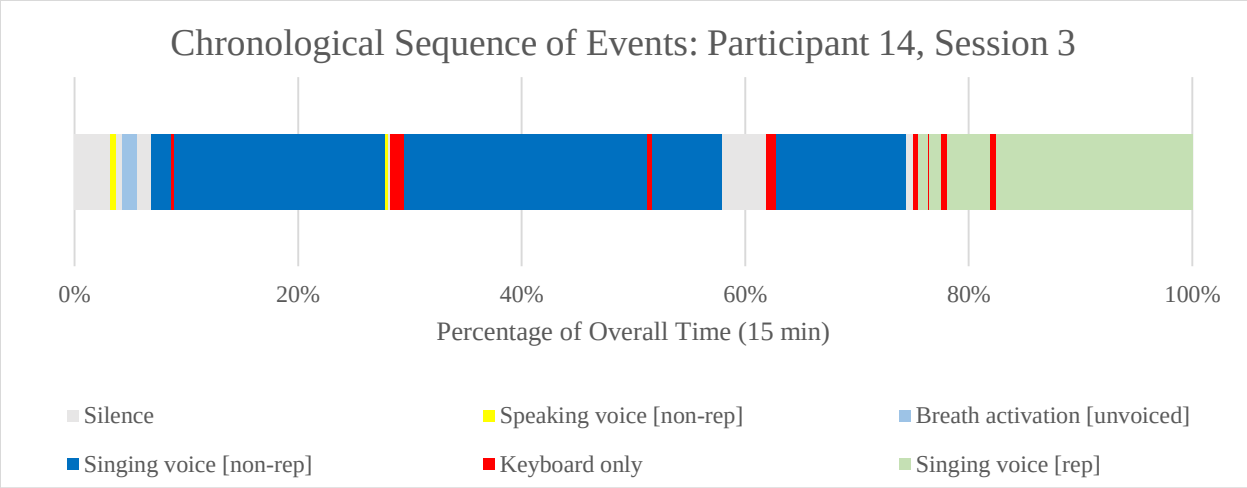

Figure L82. Chronological order of observed behavioral categories: Participant 14, Session 3.

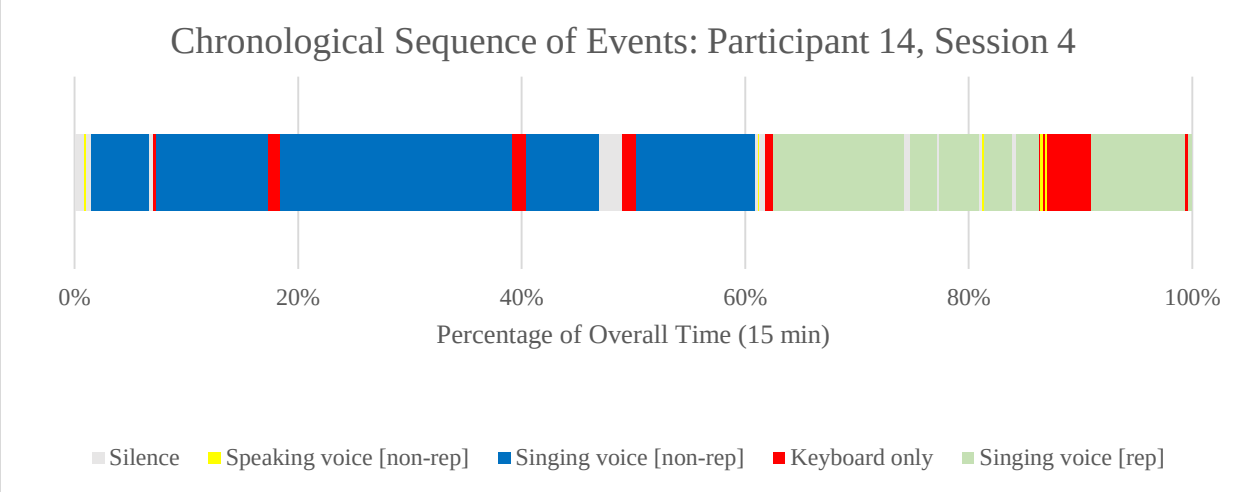

Figure L83. Chronological order of observed behavioral categories: Participant 14, Session 4.

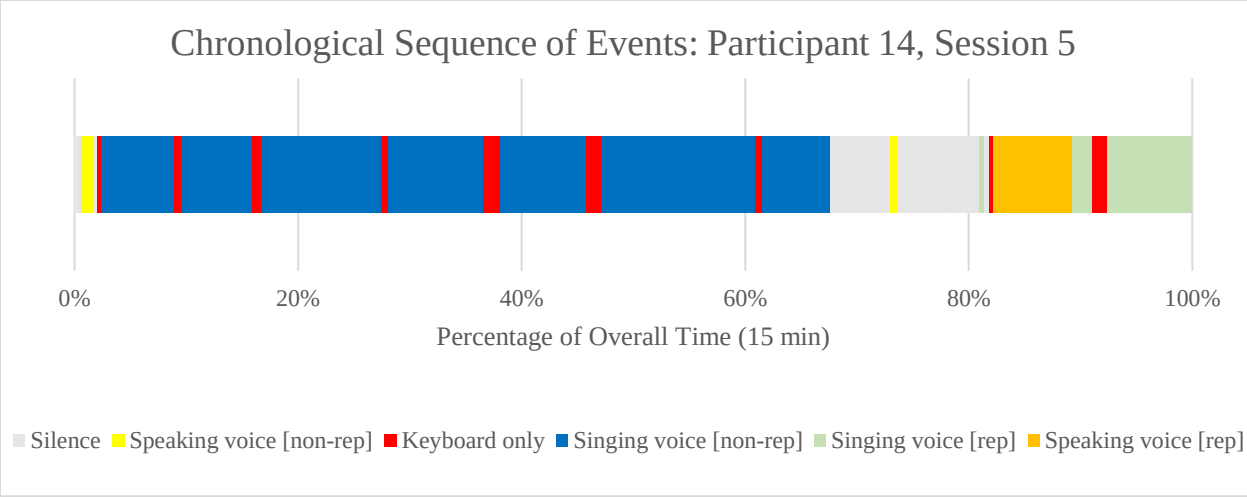

Figure L84. Chronological order of observed behavioral categories: Participant 14, Session 5.

Participant 15. Figure L85 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 15.

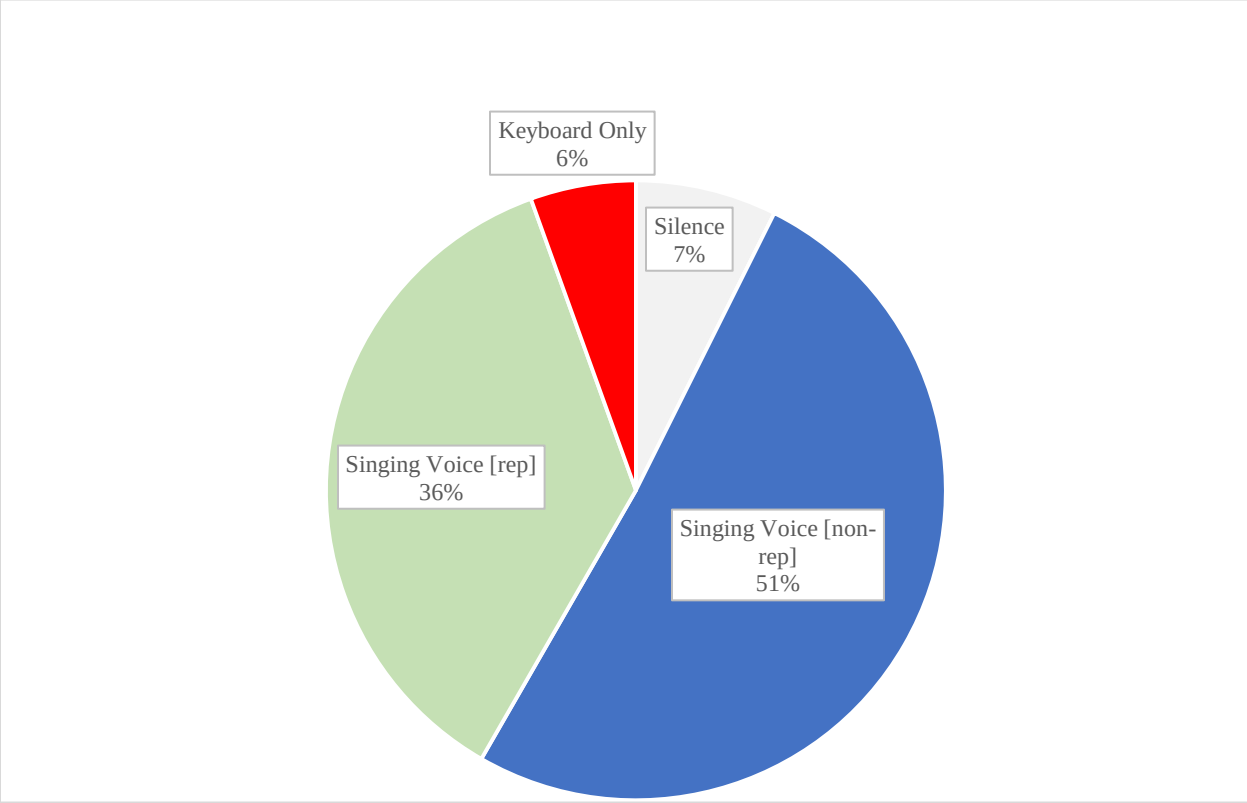

Figure L85. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 15.

Figures L86 – L90 present the chronological order of observed behavioral categories for each individual session by Participant 15.

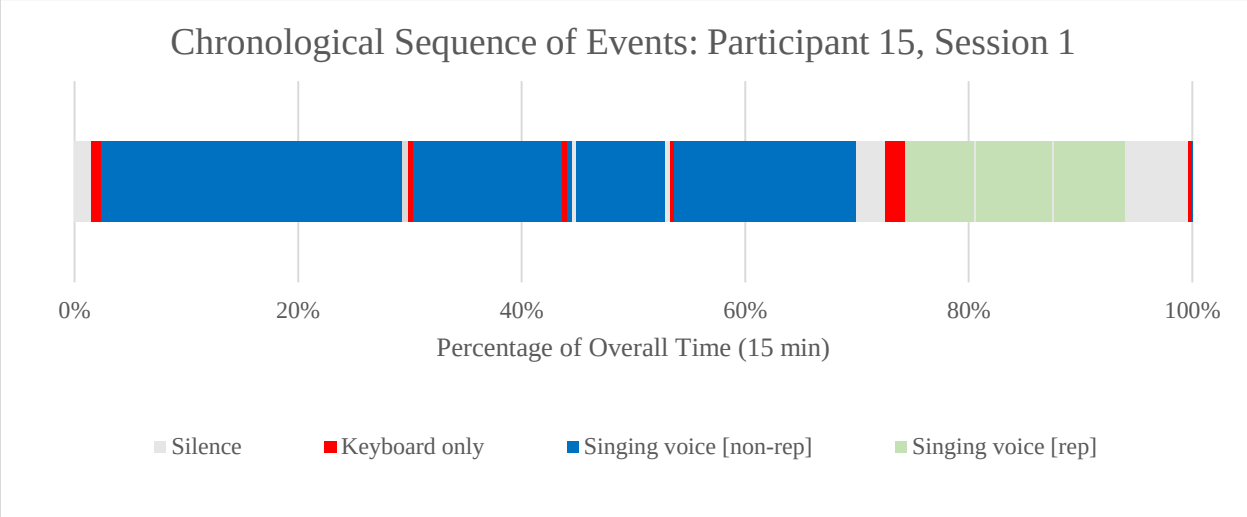

Figure L86. Chronological order of observed behavioral categories: Participant 15, Session 1.

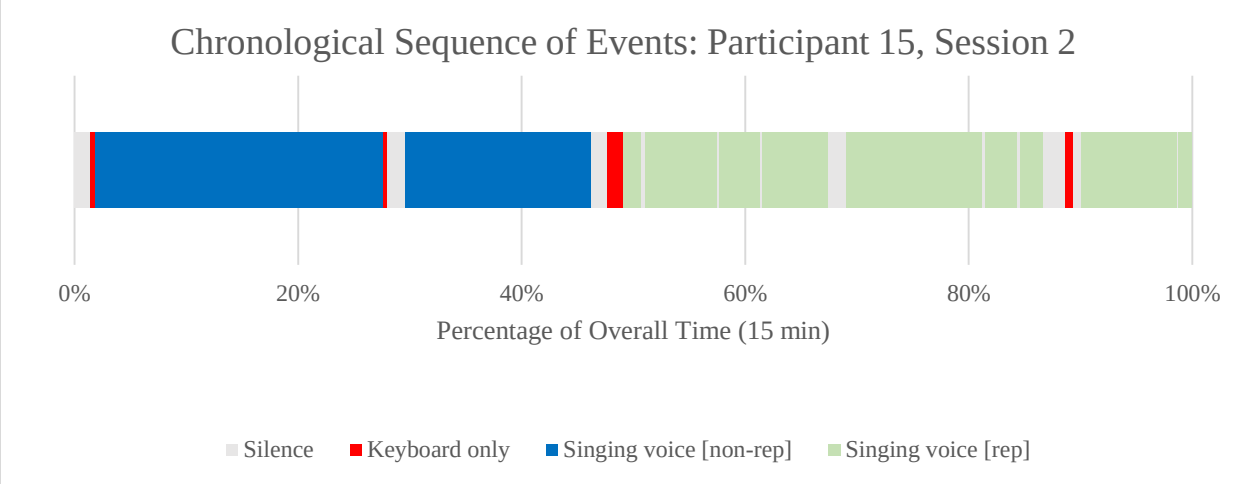

Figure L87. Chronological order of observed behavioral categories: Participant 15, Session 2.

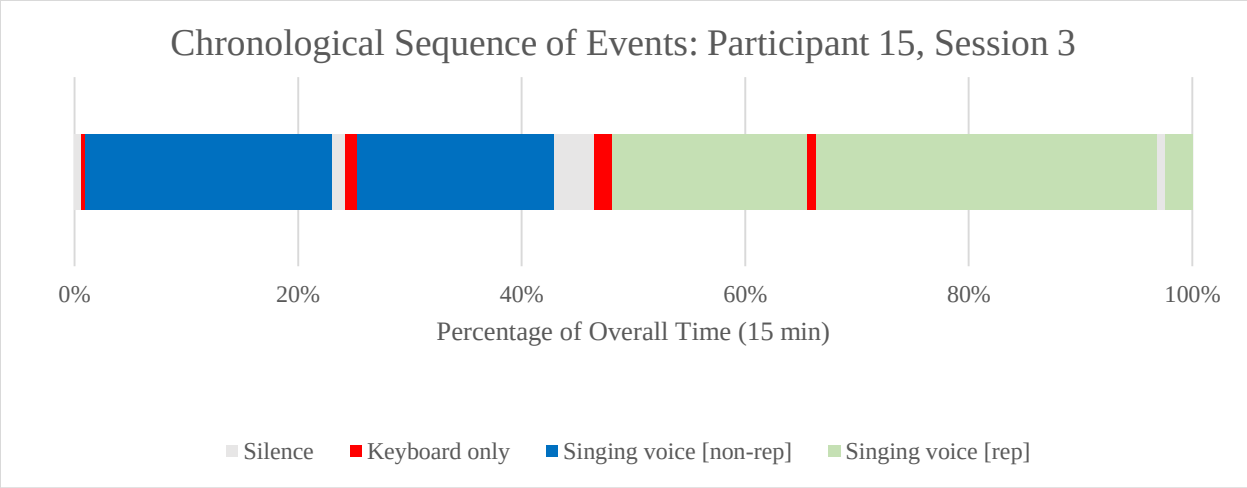

Figure L88. Chronological order of observed behavioral categories: Participant 15, Session 3.

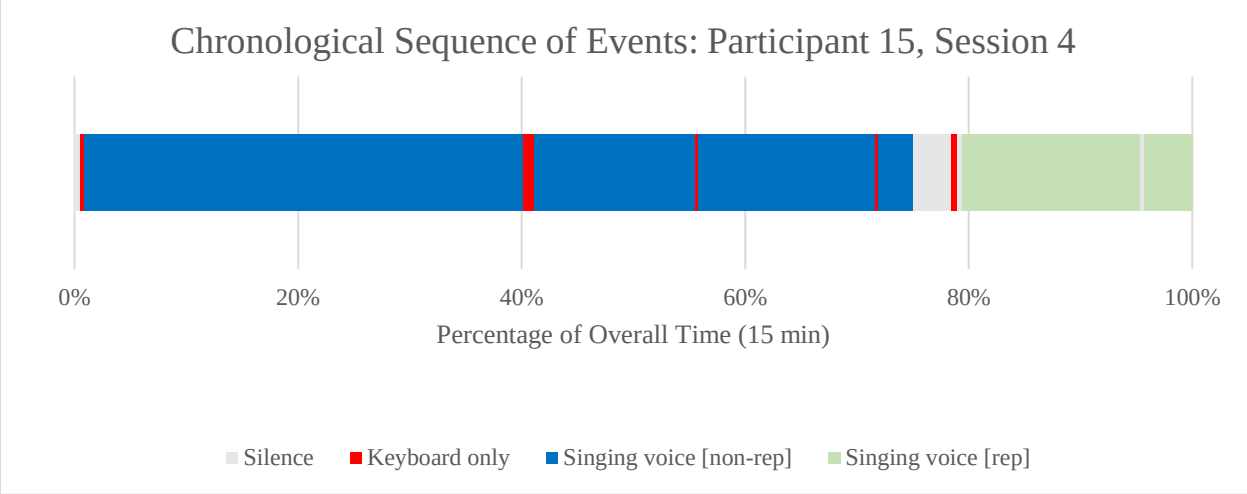

Figure L89. Chronological order of observed behavioral categories: Participant 15, Session 4.

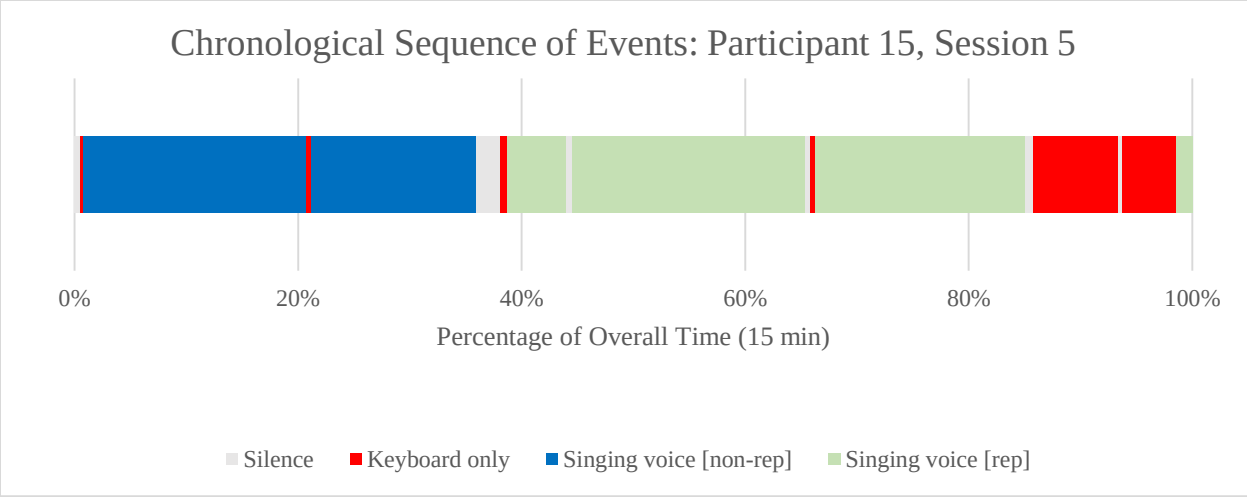

Figure L90. Chronological order of observed behavioral categories: Participant 15, Session 5.

Participant 16. Figure L91 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 16.

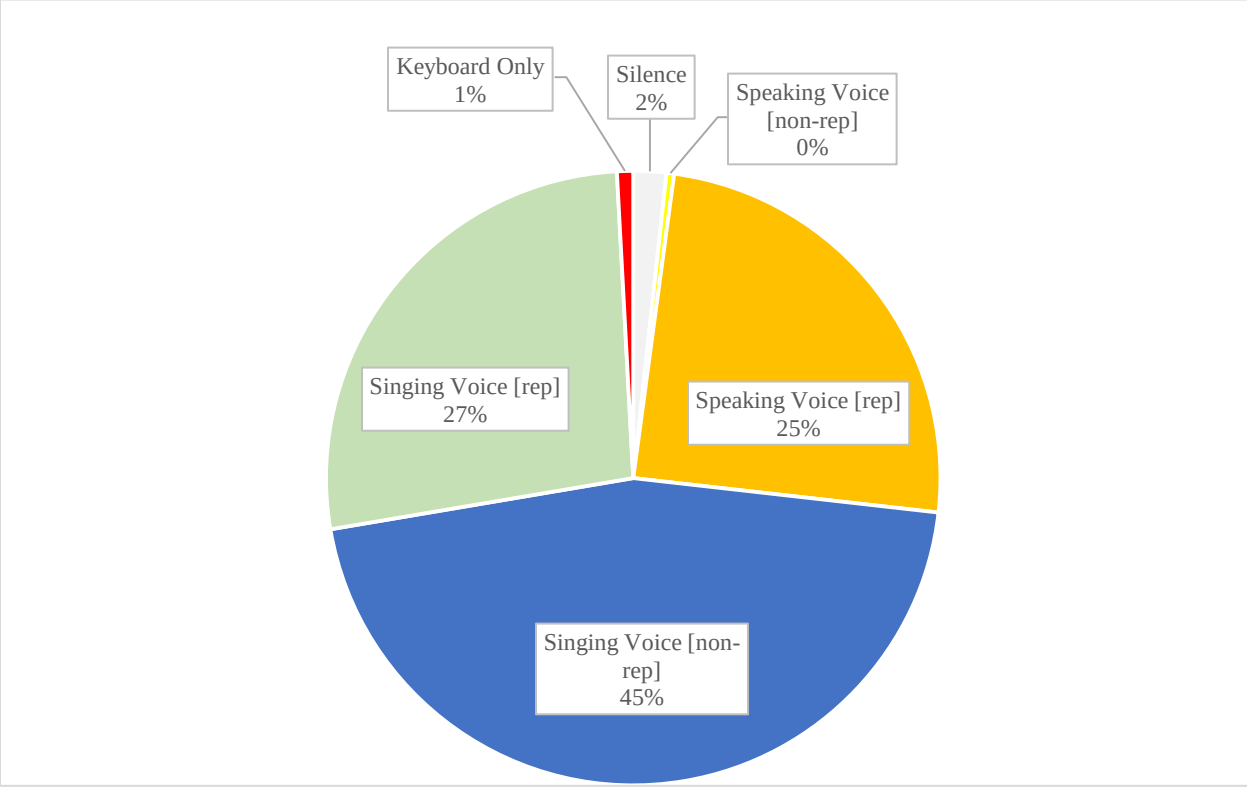

Figure L91. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 16.

Figures L92 – L96 present the chronological order of observed behavioral categories for each individual session by Participant 16.

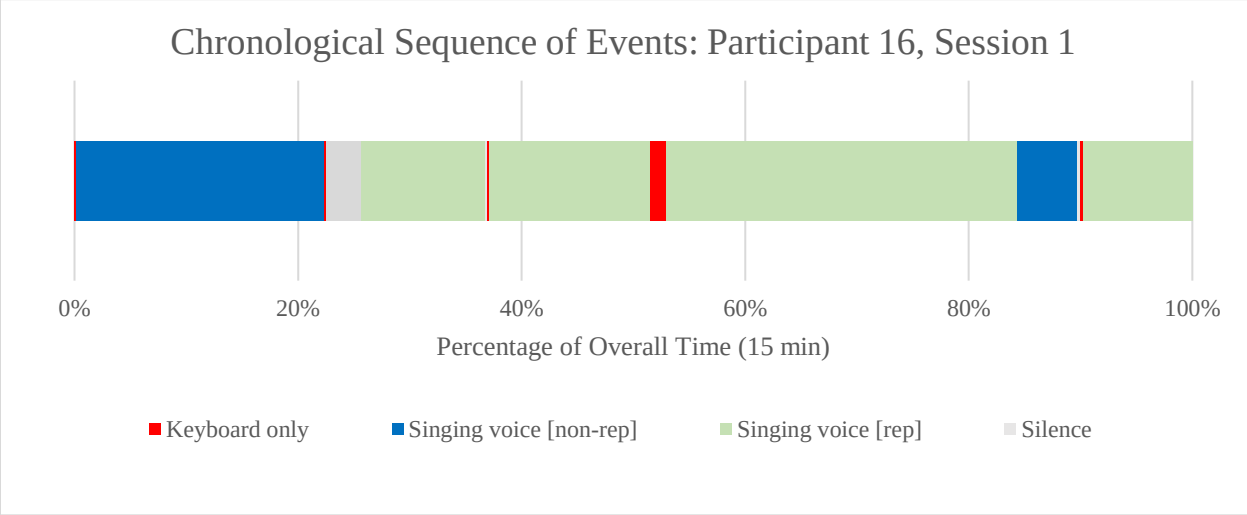

Figure L92. Chronological order of observed behavioral categories: Participant 16, Session 1.

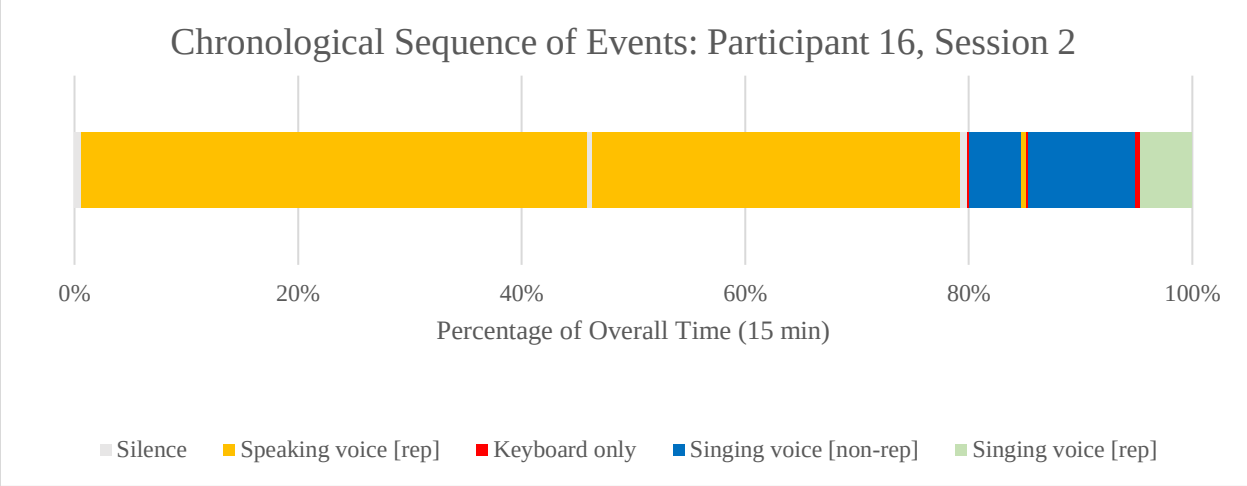

Figure L93. Chronological order of observed behavioral categories: Participant 16, Session 2.

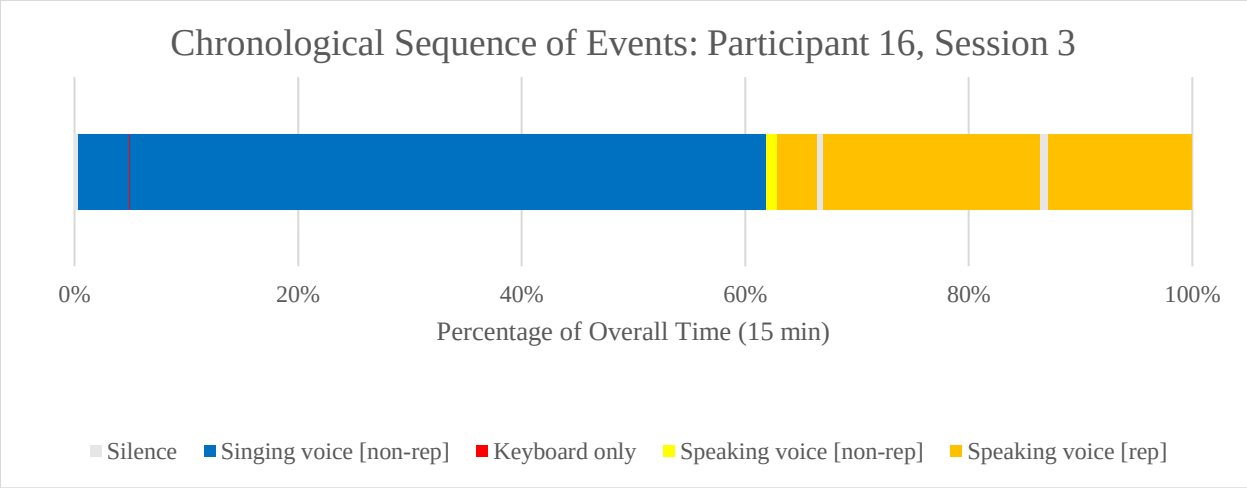

Figure L94. Chronological order of observed behavioral categories: Participant 16, Session 3.

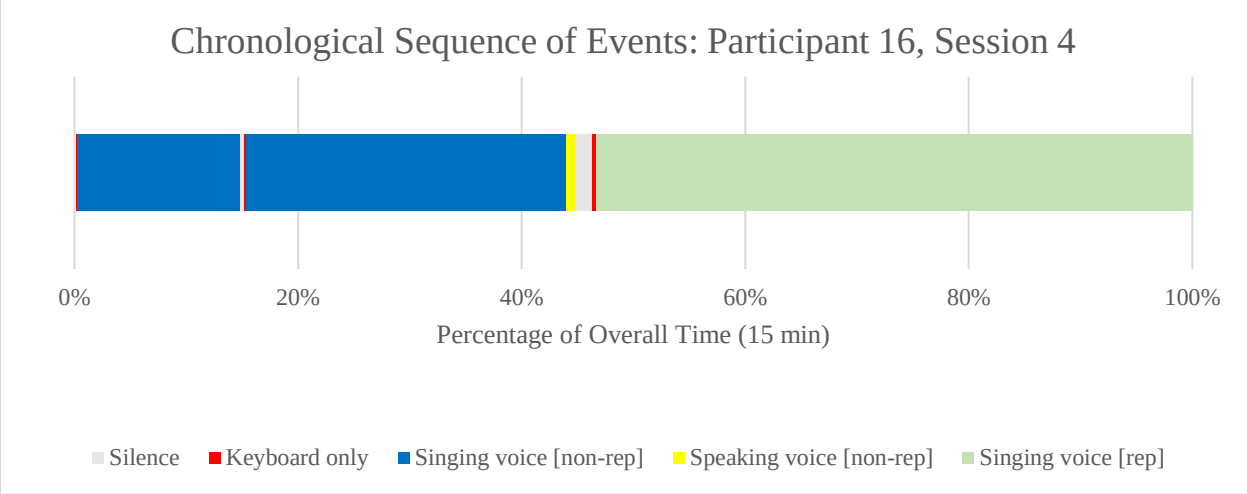

Figure L95. Chronological order of observed behavioral categories: Participant 16, Session 4.

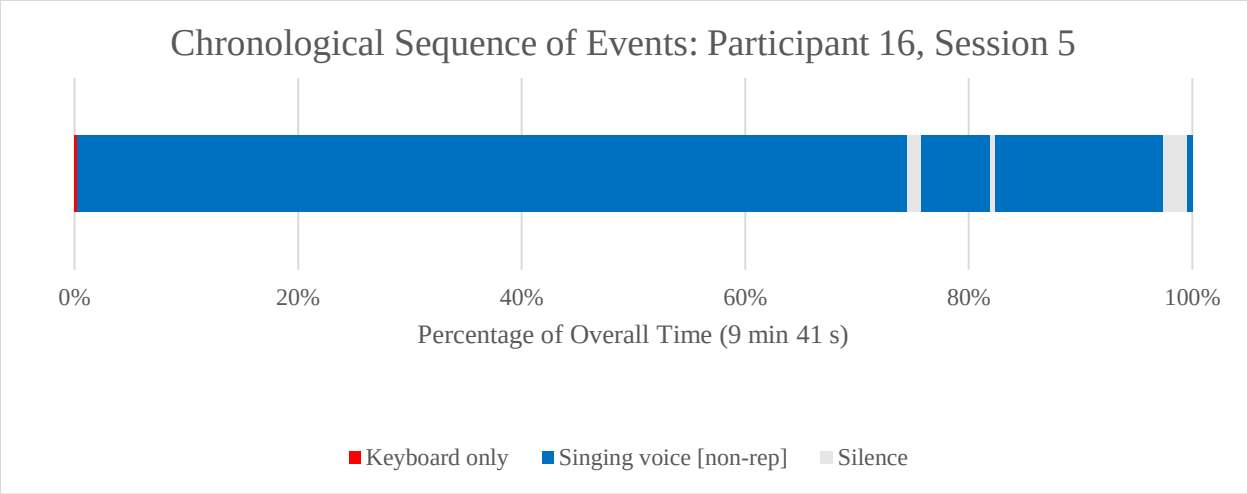

Figure L96. Chronological order of observed behavioral categories: Participant 16, Session 5.

Participant 17. Figure L97 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 17.

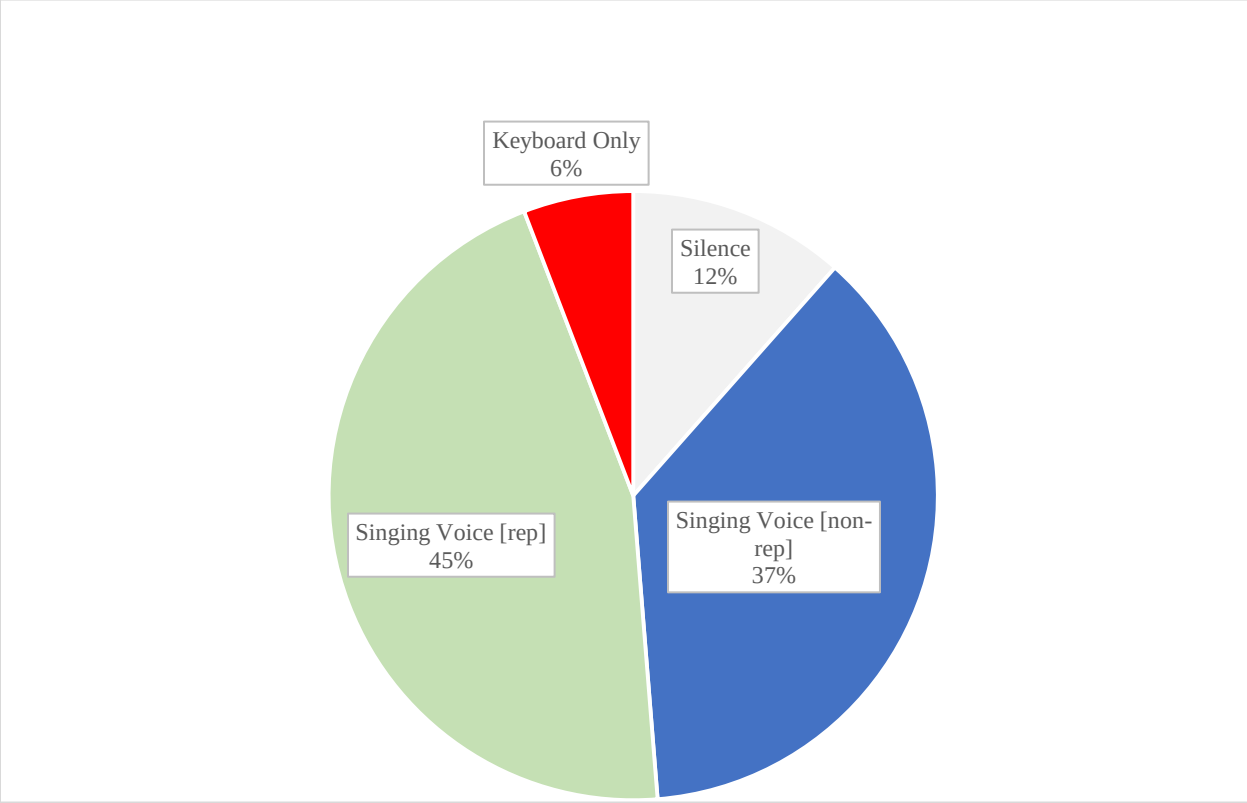

Figure L97. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 17.

Figures L98 – L102 present the chronological order of observed behavioral categories for each individual session by Participant 17.

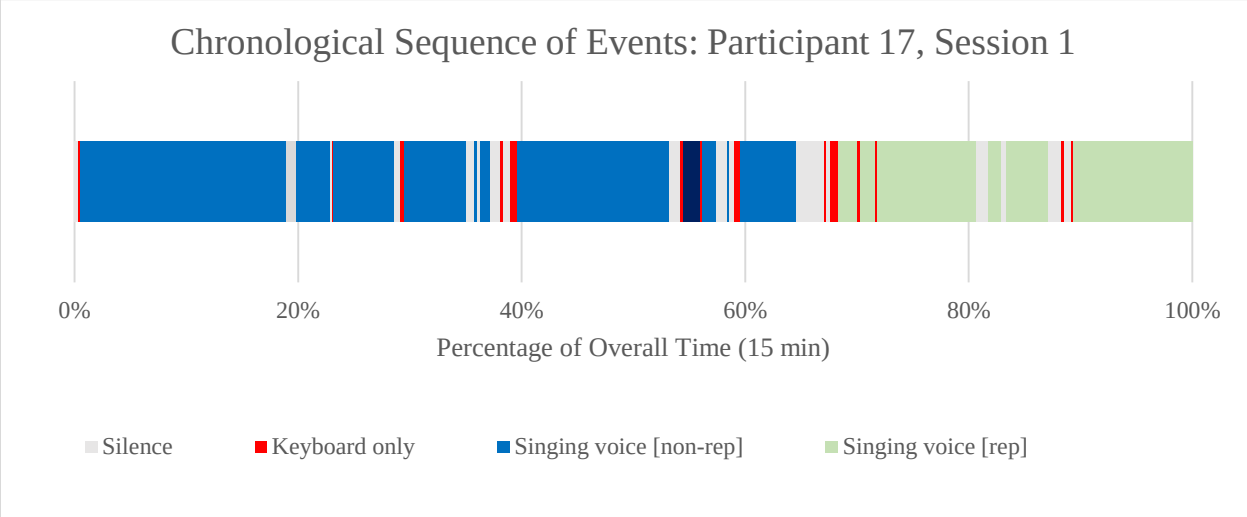

Figure L98. Chronological order of observed behavioral categories: Participant 17, Session 1.

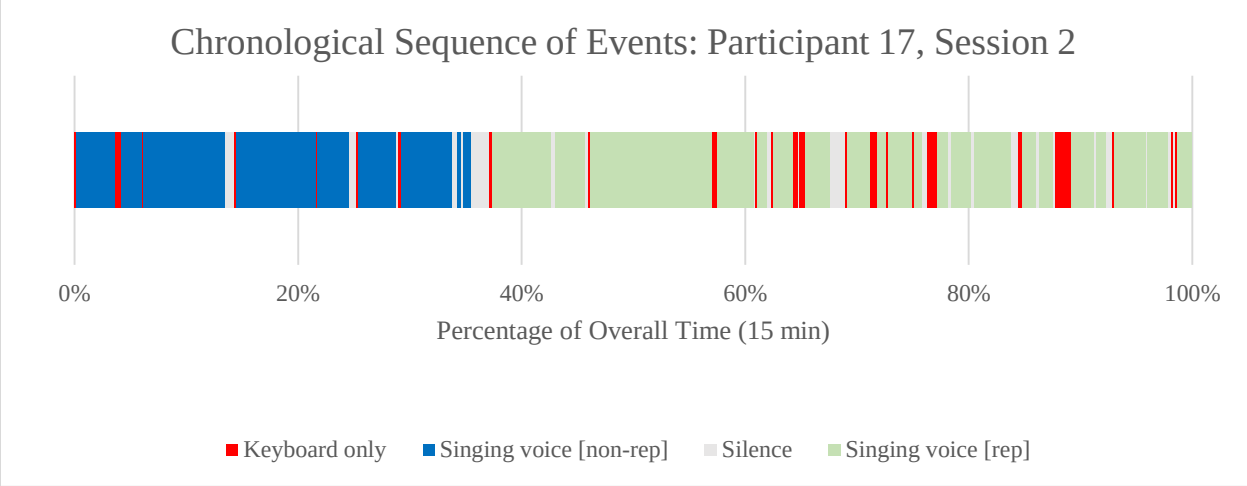

Figure L99. Chronological order of observed behavioral categories: Participant 17, Session 2.

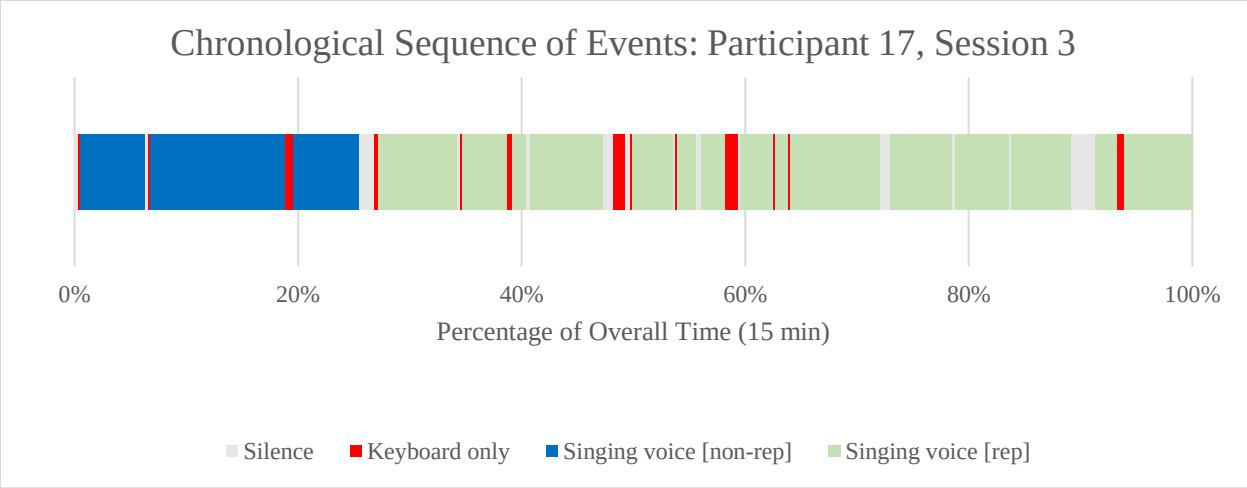

Figure L100. Chronological order of observed behavioral categories: Participant 17, Session 3.

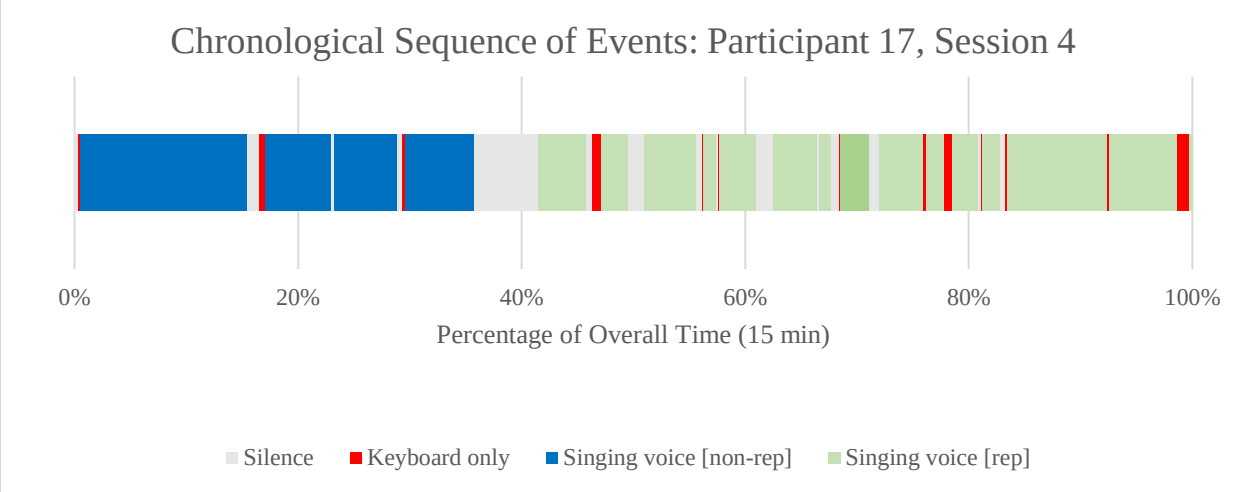

Figure L101. Chronological order of observed behavioral categories: Participant 17, Session 4.

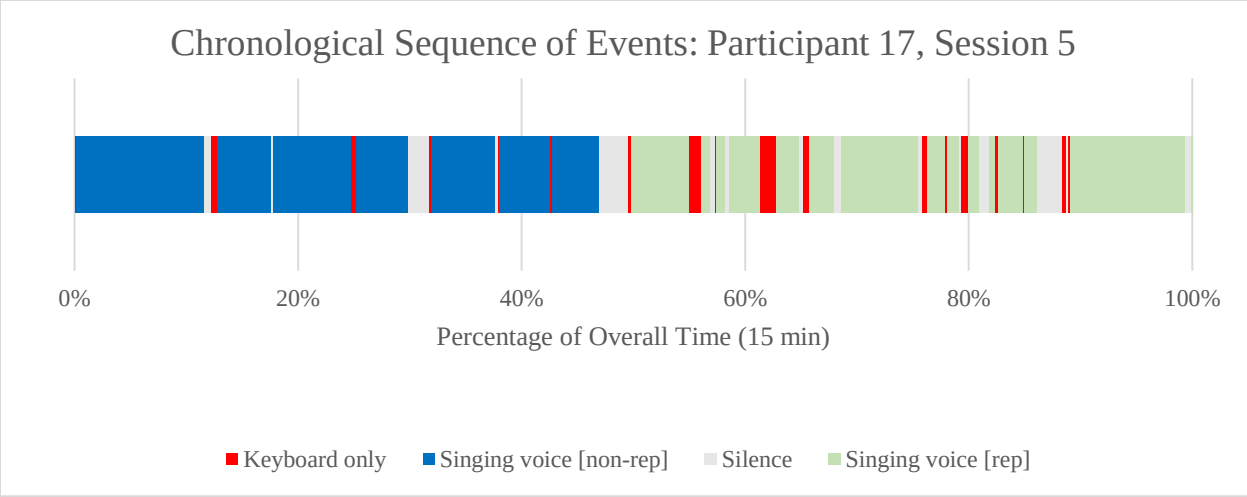

Figure L102. Chronological order of observed behavioral categories: Participant 17, Session 5.

Participant 18. Figure L103 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 18.

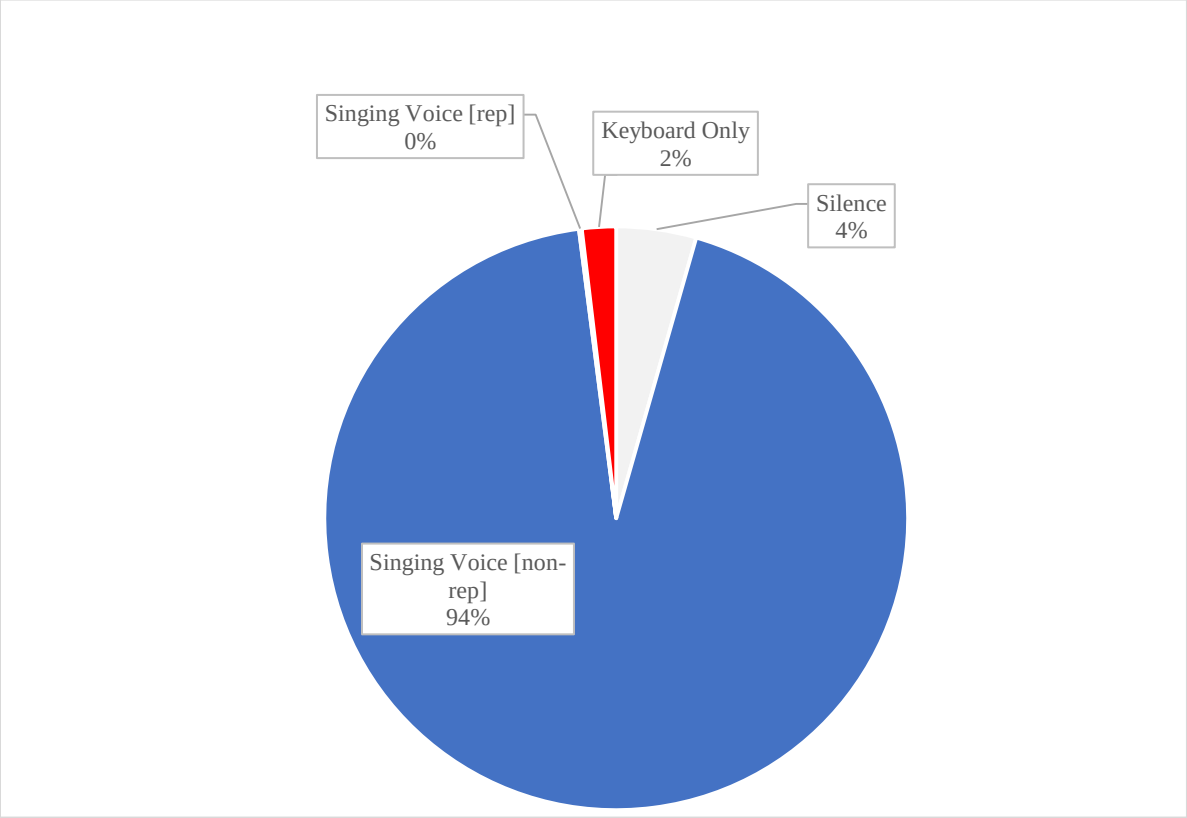

Figure L103. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 18.

Figures L104 – L108 present the chronological order of observed behavioral categories for each individual session by Participant 18.

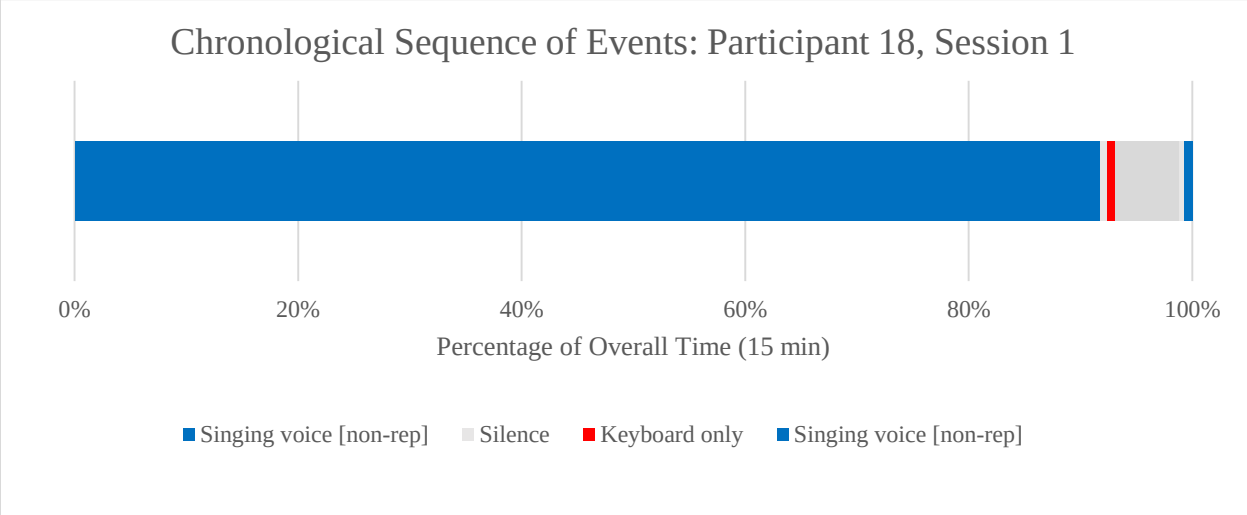

Figure L104. Chronological order of observed behavioral categories: Participant 18, Session 1.

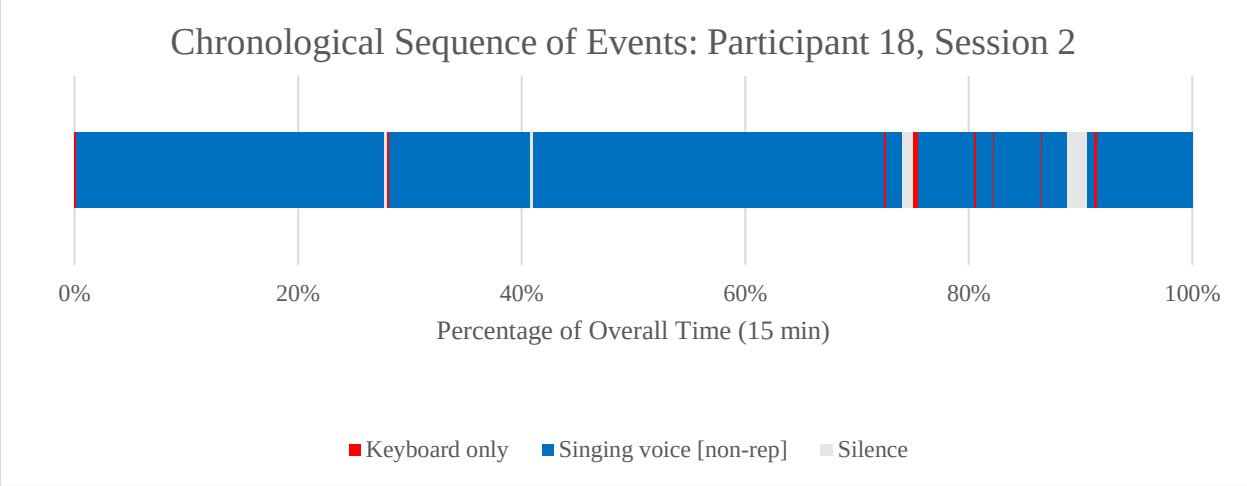

Figure L105. Chronological order of observed behavioral categories: Participant 18, Session 2.

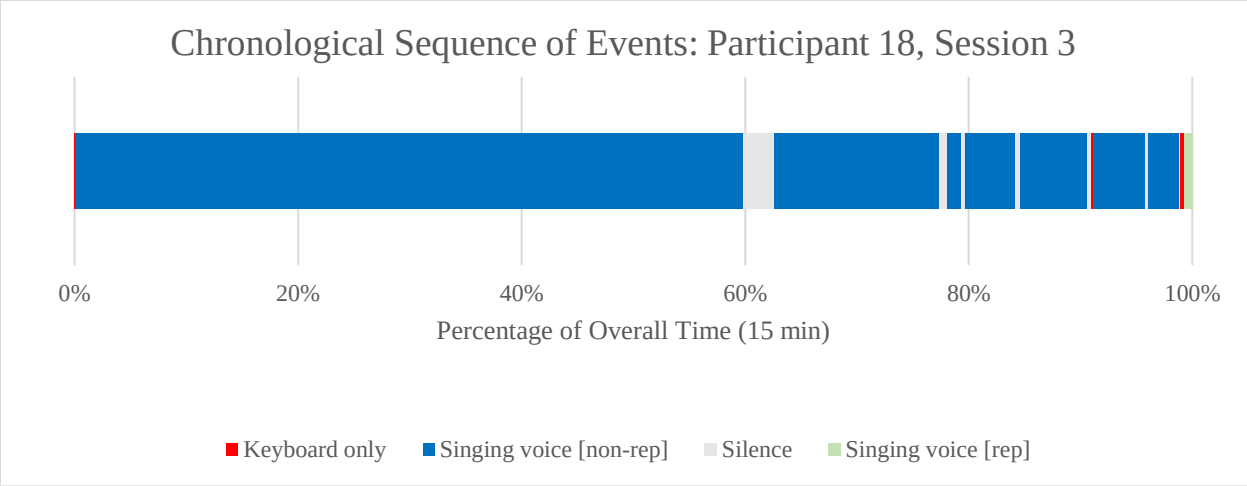

Figure L106. Chronological order of observed behavioral categories: Participant 18, Session 3.

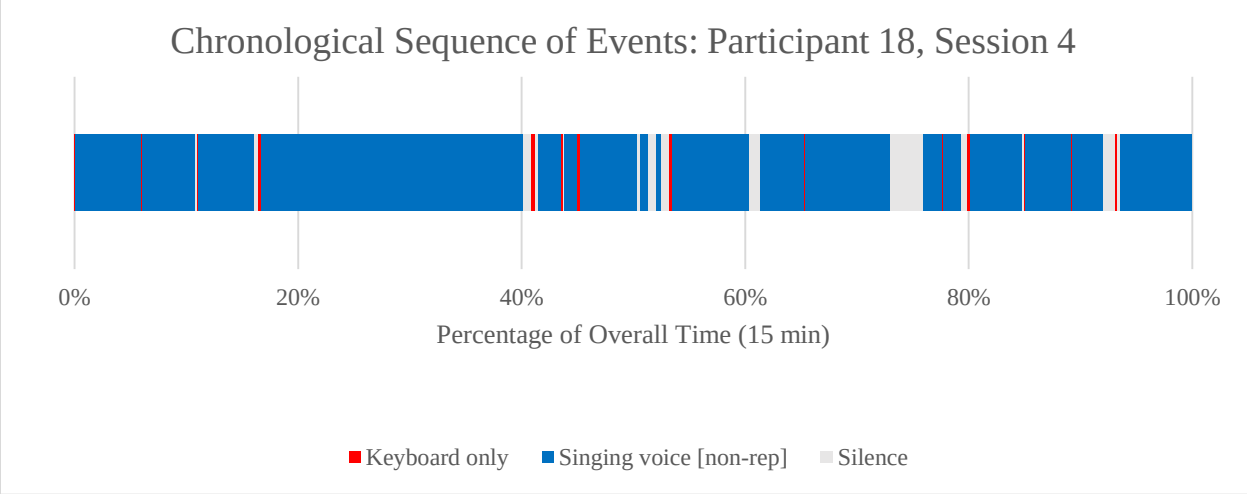

Figure L107. Chronological order of observed behavioral categories: Participant 18, Session 4.

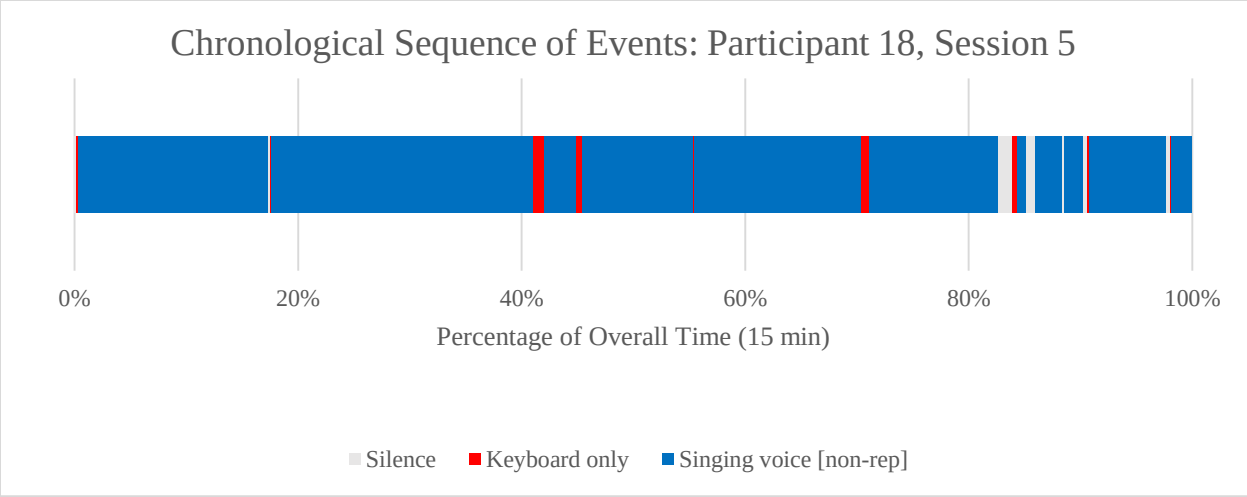

Figure L108. Chronological order of observed behavioral categories: Participant 18, Session 5.

Participant 19. Figure L109 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 19.

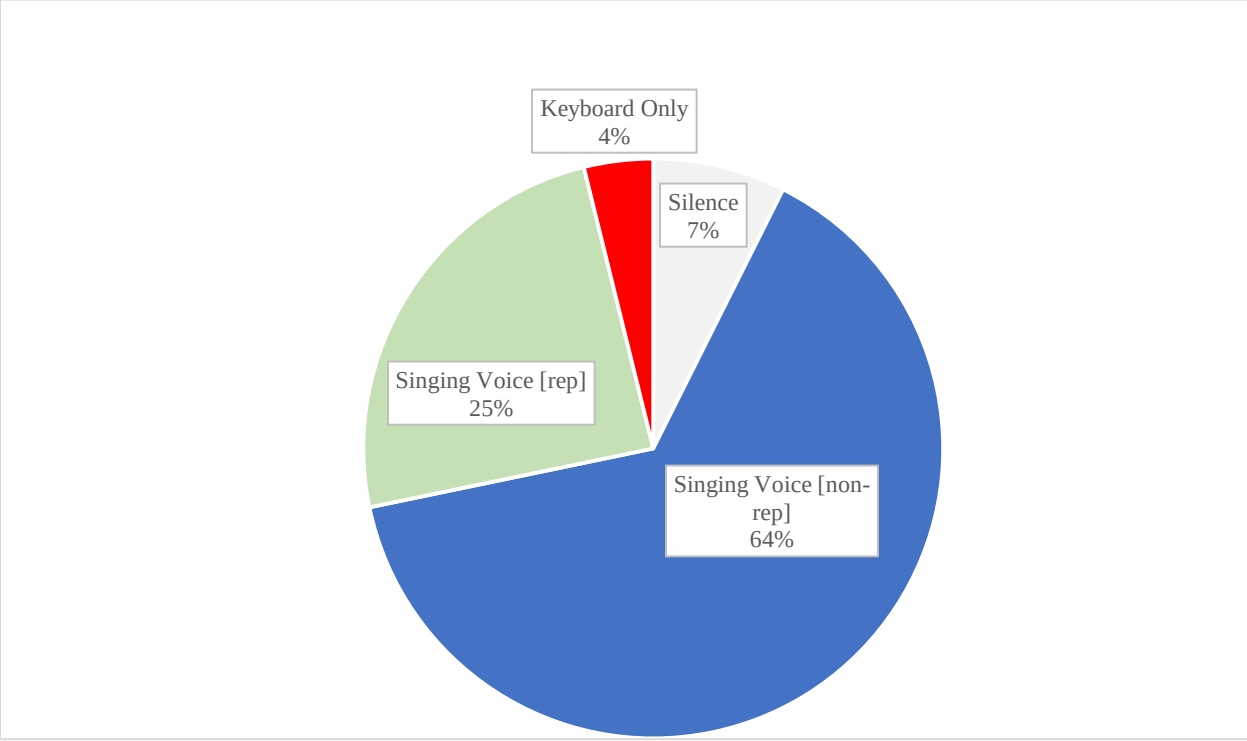

Figure L109. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 19.

Figure L110 – L114 present the chronological order of observed behavioral categories for each individual session by Participant 19.

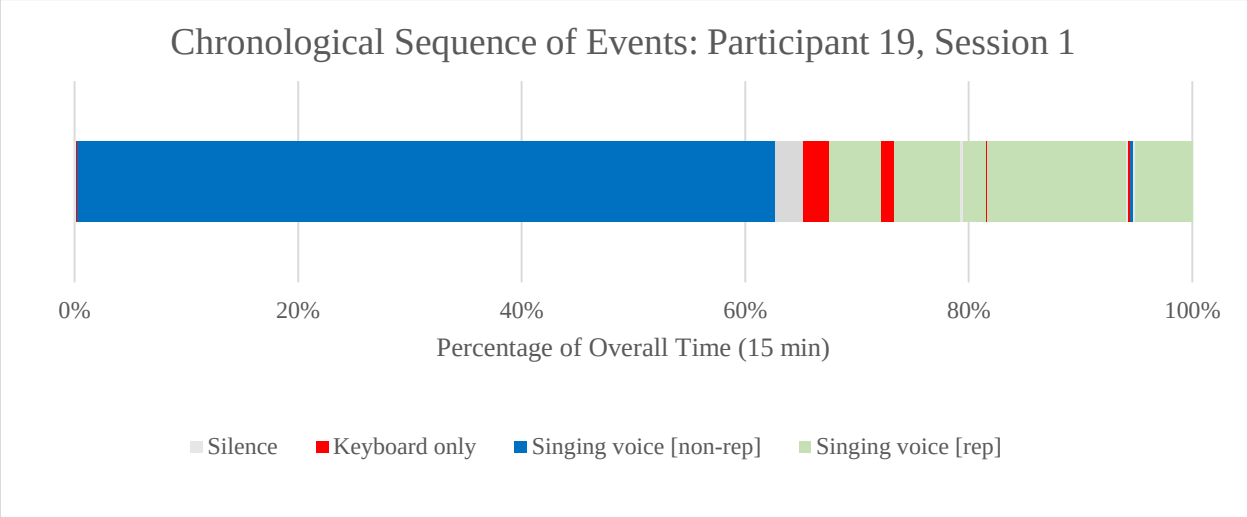

Figure L110. Chronological order of observed behavioral categories: Participant 19, Session 1.

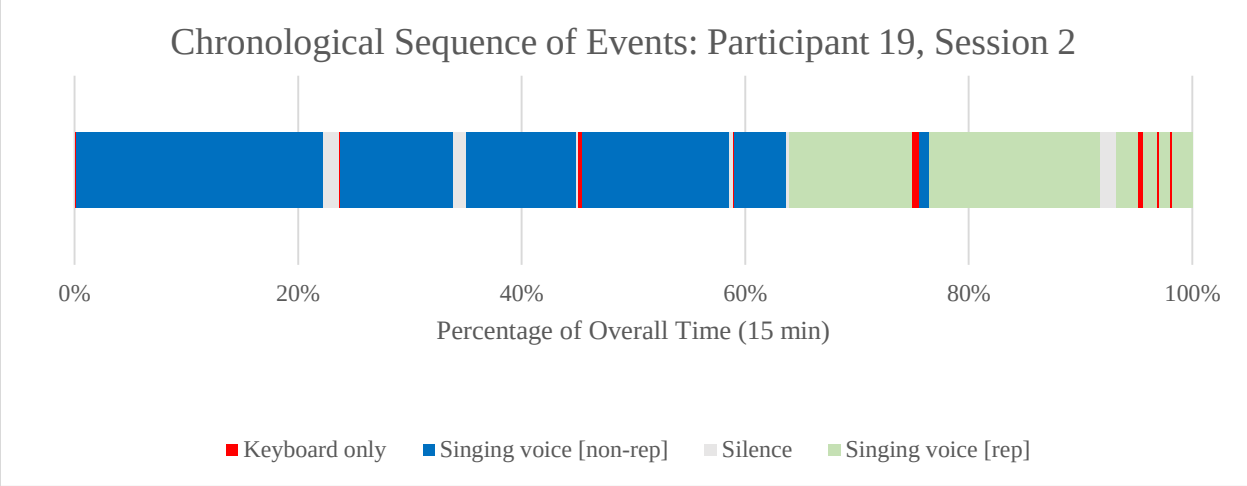

Figure L111. Chronological order of observed behavioral categories: Participant 19, Session 2.

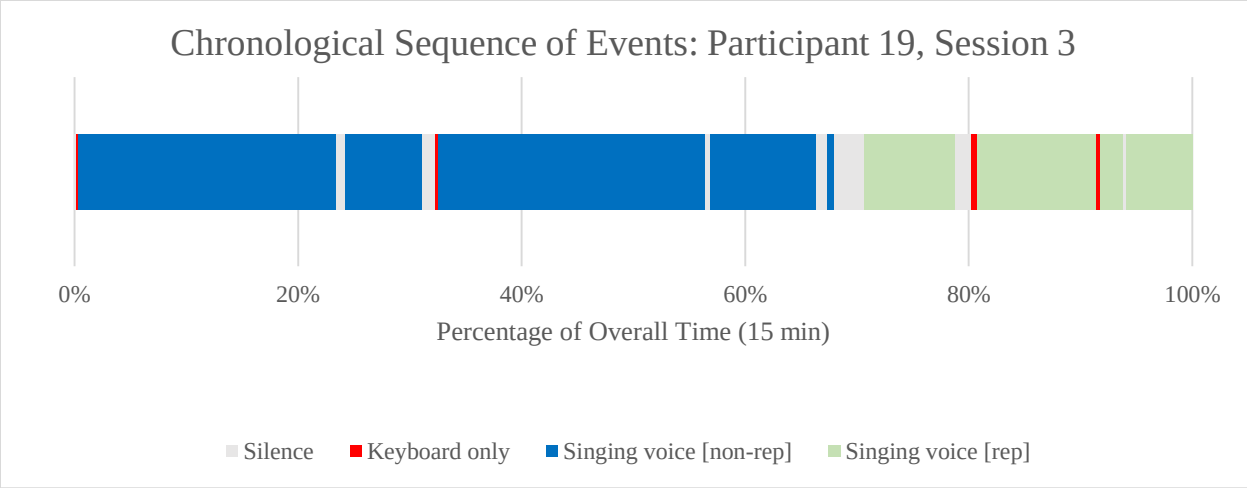

Figure L112. Chronological order of observed behavioral categories: Participant 19, Session 3.

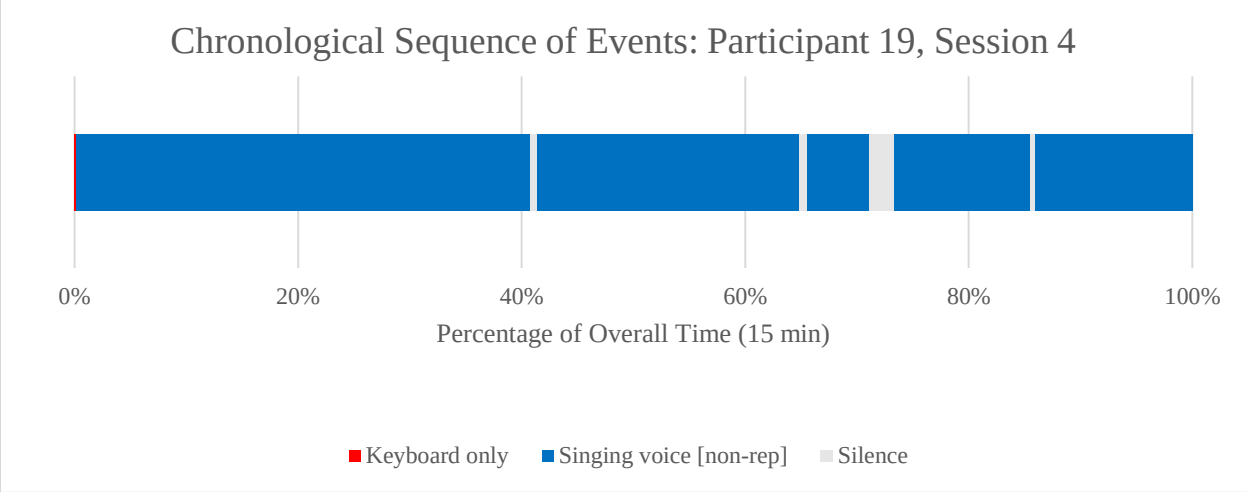

Figure L113. Chronological order of observed behavioral categories: Participant 19, Session 4.

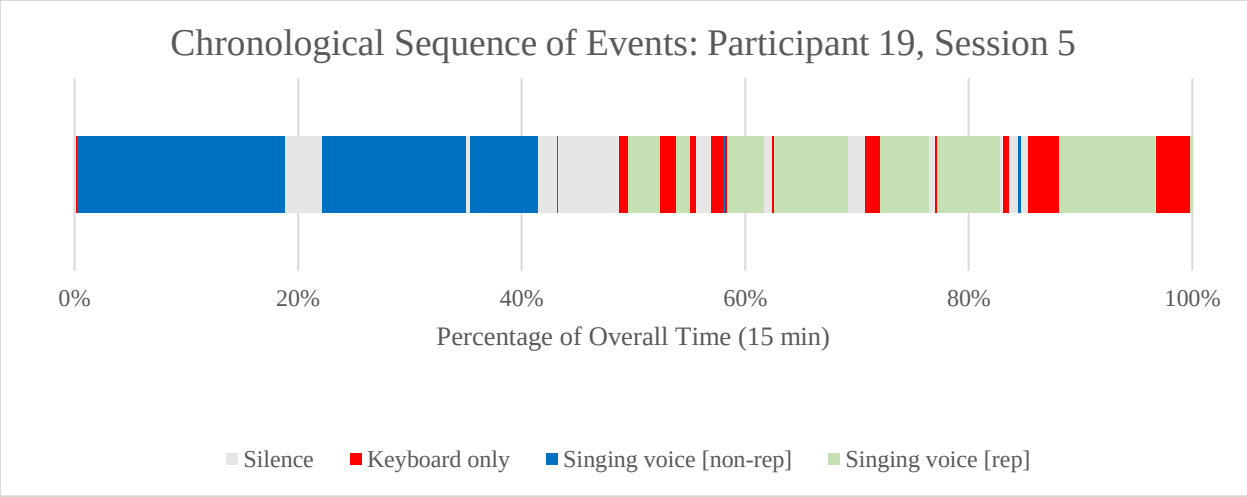

Figure L114. Chronological order of observed behavioral categories: Participant 19, Session 5.

Participant 20. Figure L115 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 20.

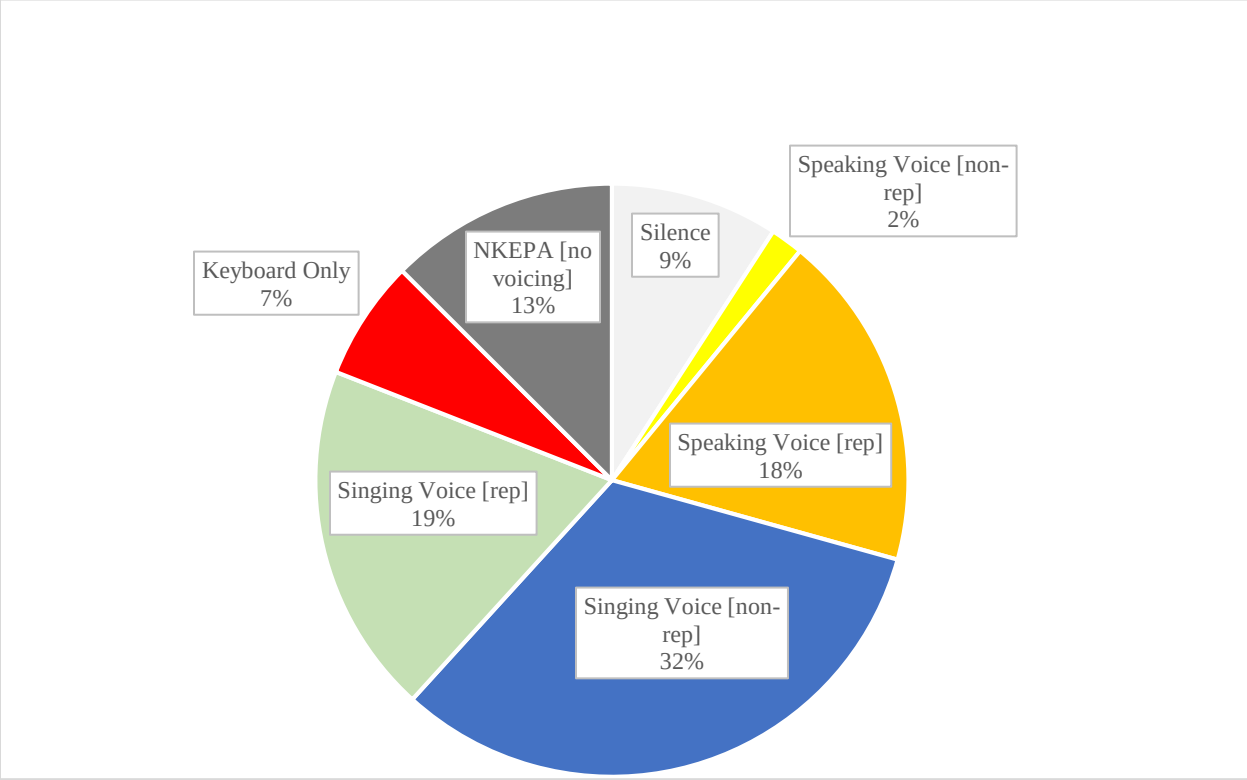

Figure L115. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 20.

Figures L116 – L120 present the chronological order of observed behavioral categories for each individual session by Participant 20.

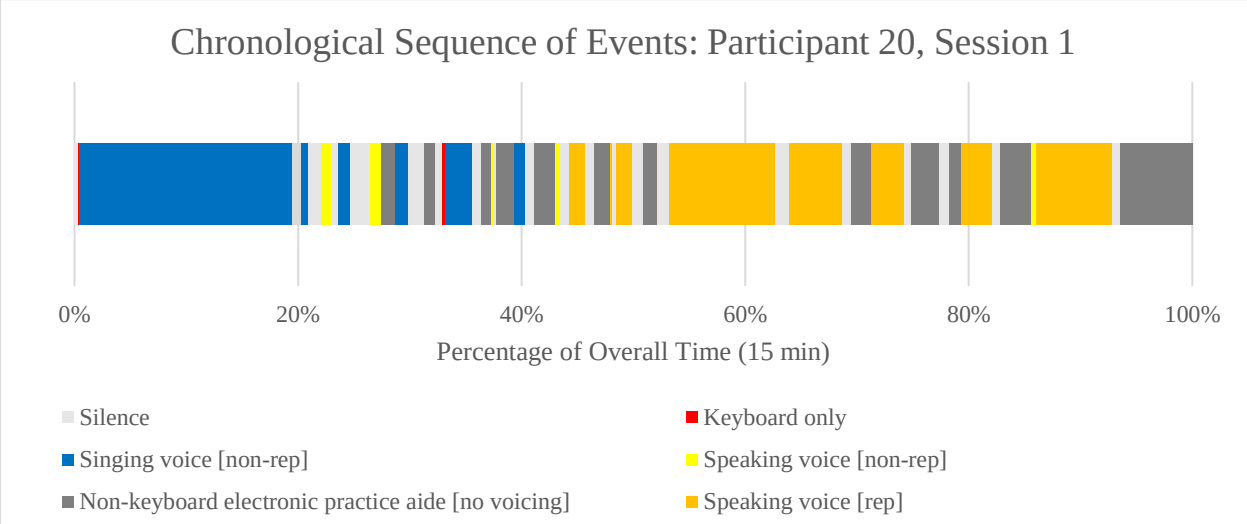

Figure L116. Chronological order of observed behavioral categories: Participant 20, Session 1.

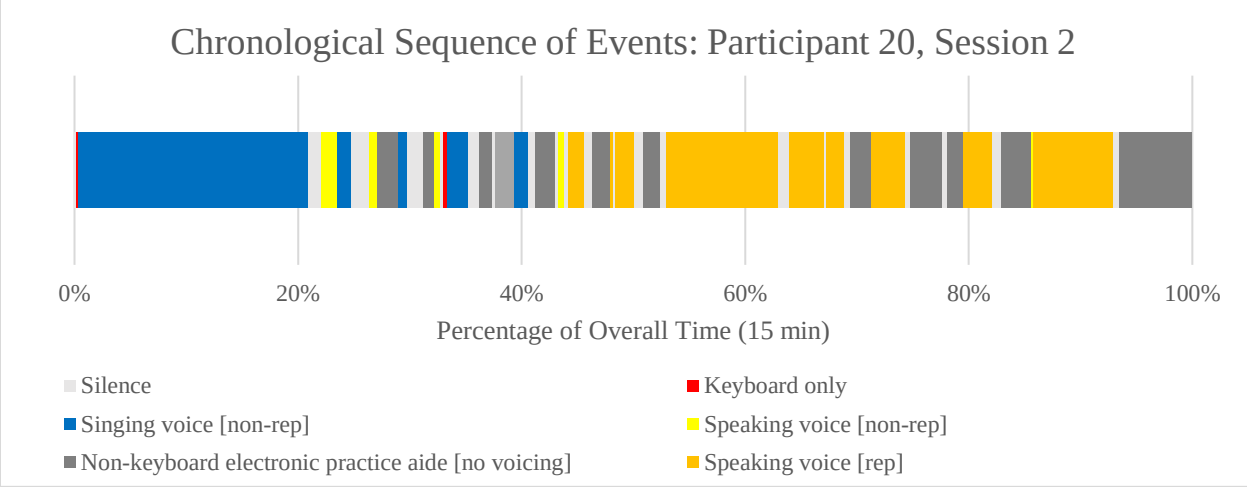

Figure L117. Chronological order of observed behavioral categories: Participant 20, Session 2.

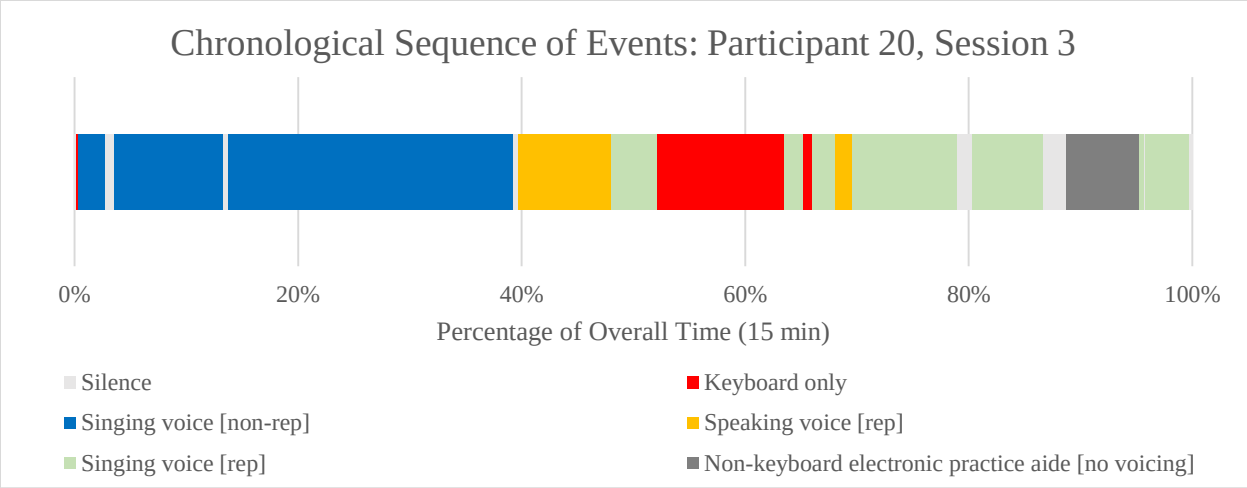

Figure L118. Chronological order of observed behavioral categories: Participant 20, Session 3.

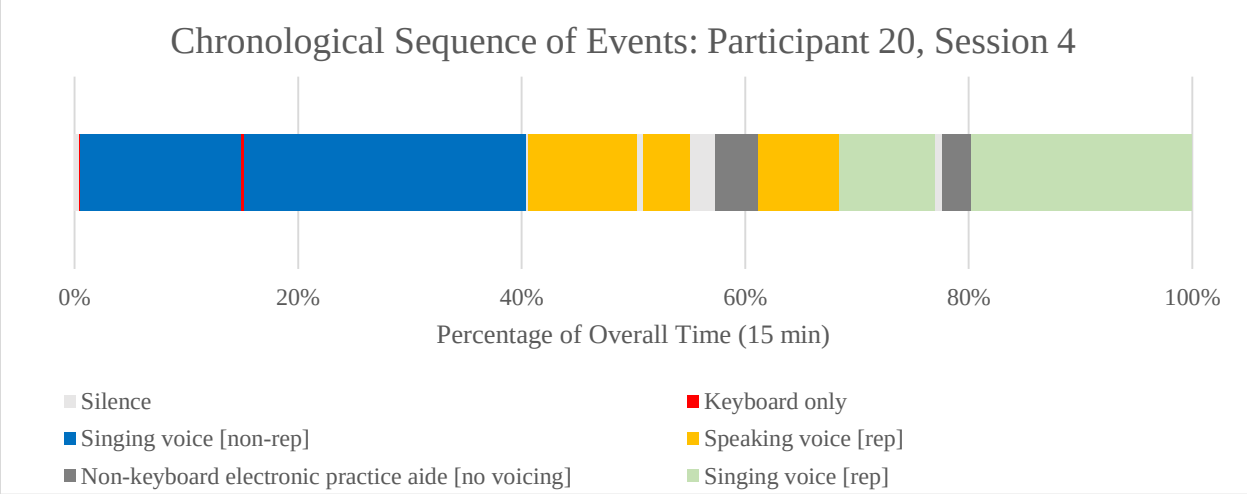

Figure L119. Chronological order of observed behavioral categories: Participant 20, Session 4.

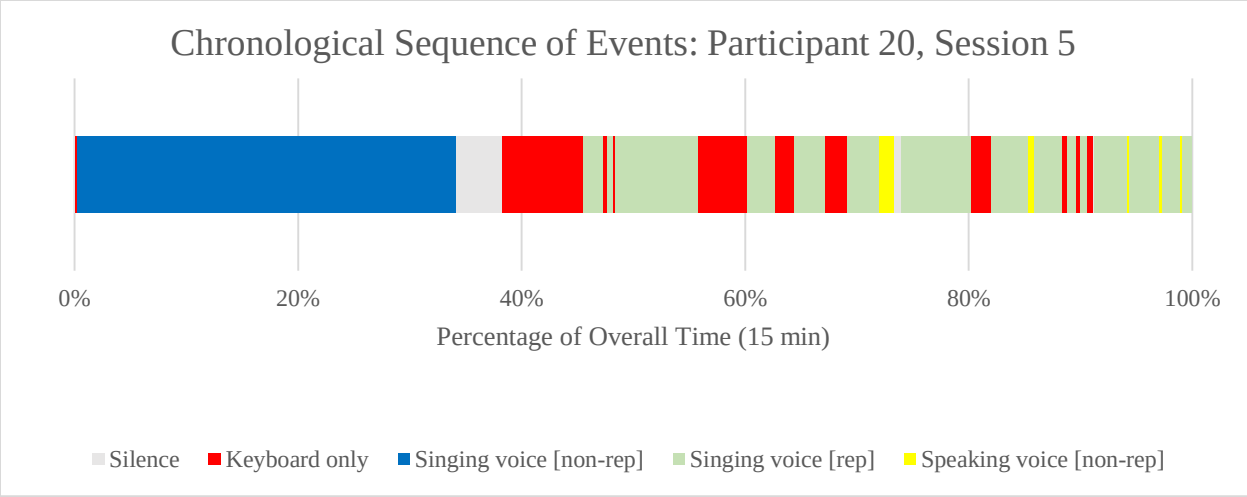

Figure L120. Chronological order of observed behavioral categories: Participant 20, Session 5.

Participant 21. Figure L121 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 21.

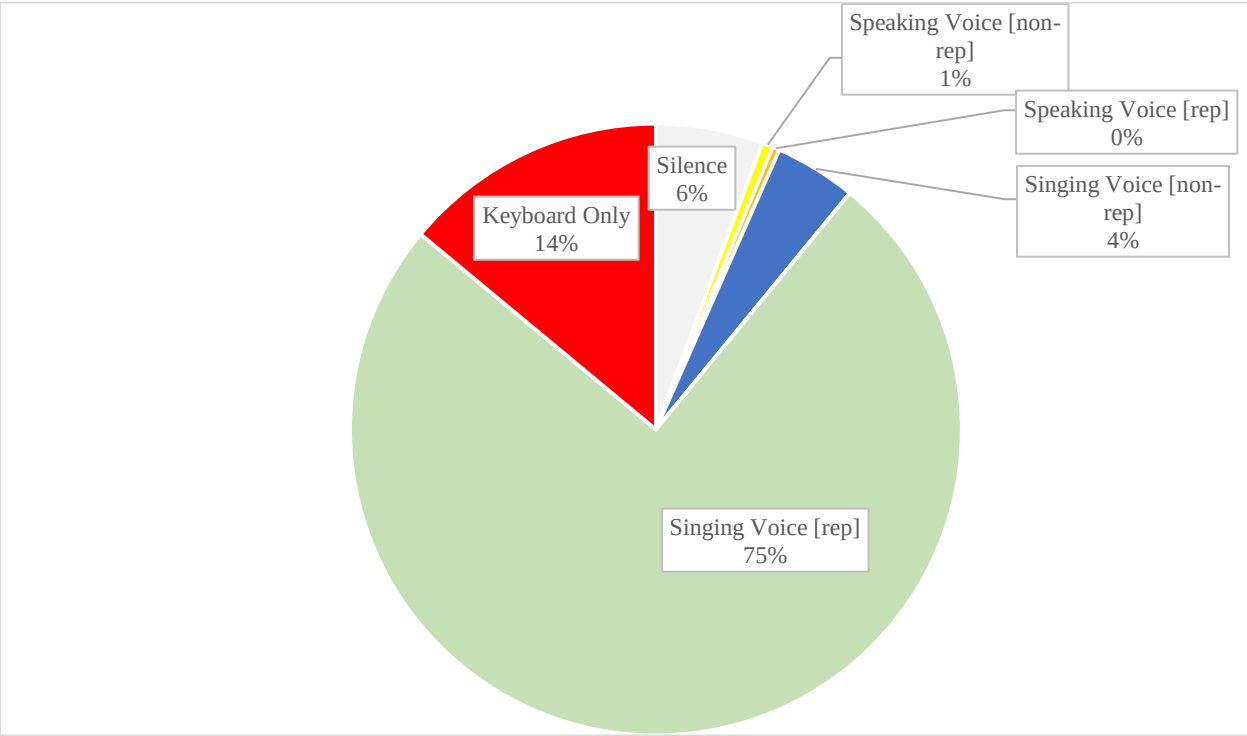

Figure L121. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 21.

Figures L122 – L126 present the chronological order of observed behavioral categories for each individual session by Participant 21.

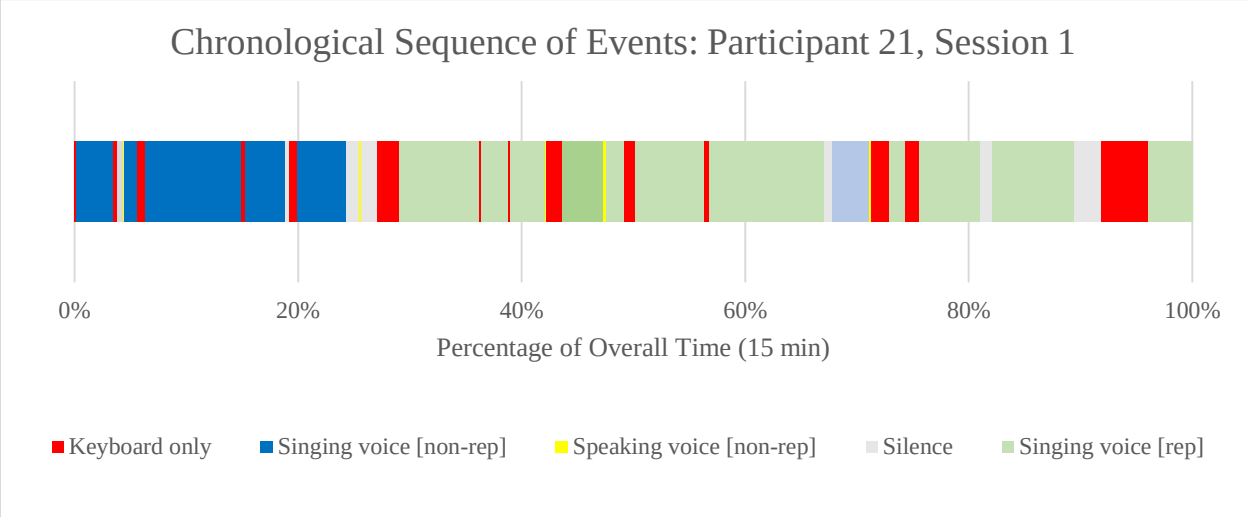

Figure L122. Chronological order of observed behavioral categories: Participant 21, Session 1.

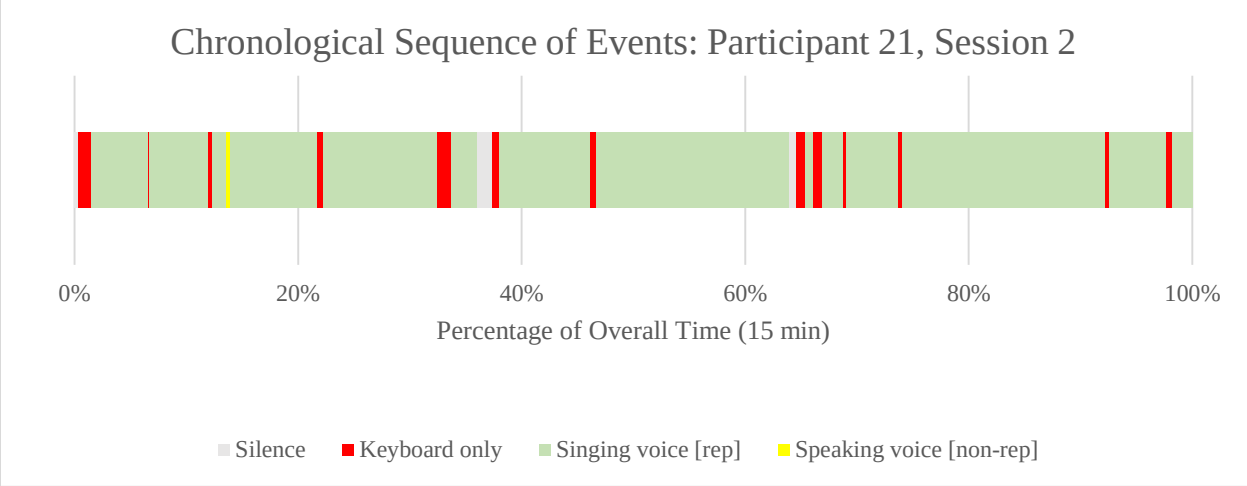

Figure L123. Chronological order of observed behavioral categories: Participant 21, Session 2.

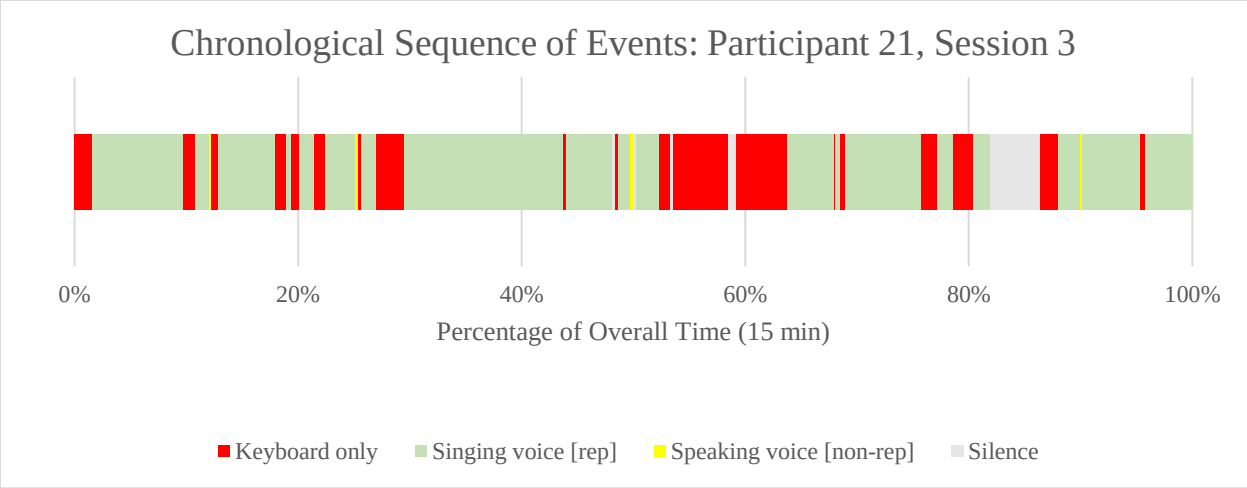

Figure L124. Chronological order of observed behavioral categories: Participant 21, Session 3.

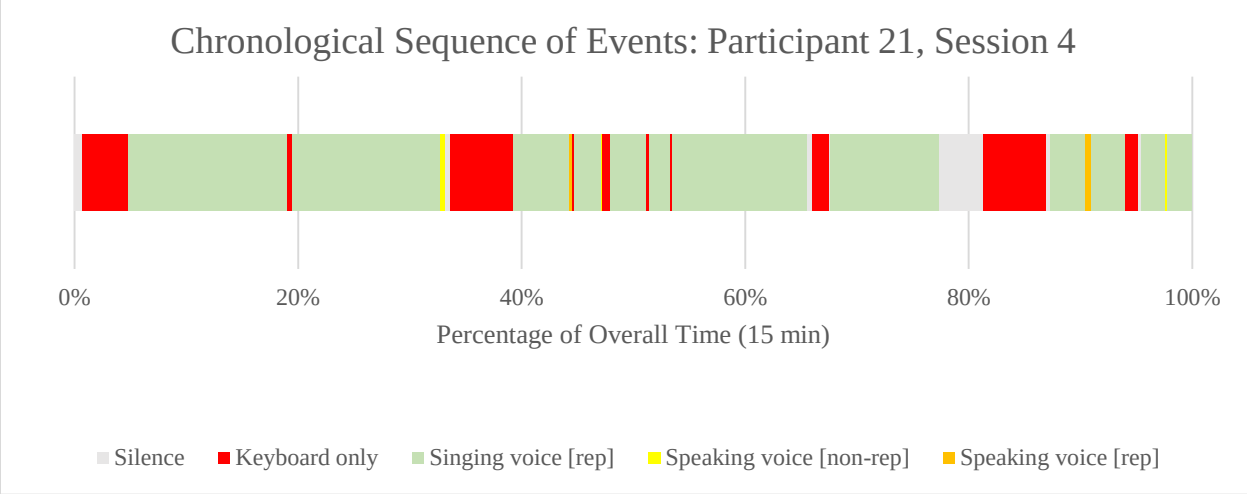

Figure L125. Chronological order of observed behavioral categories: Participant 21, Session 4.

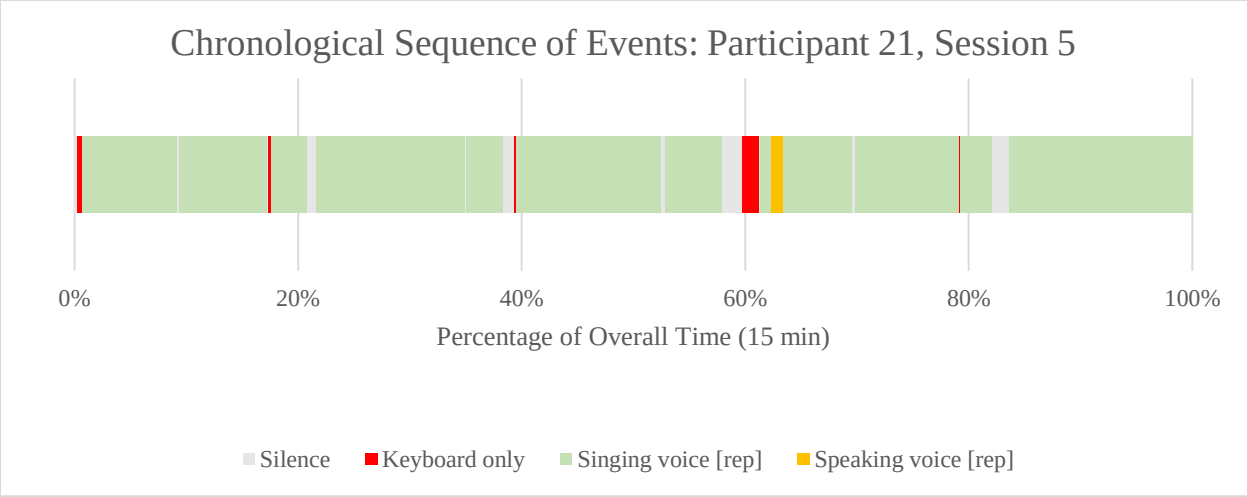

Figure L126. Chronological order of observed behavioral categories: Participant 21, Session 5.

Participant 22. Figure L127 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 22.

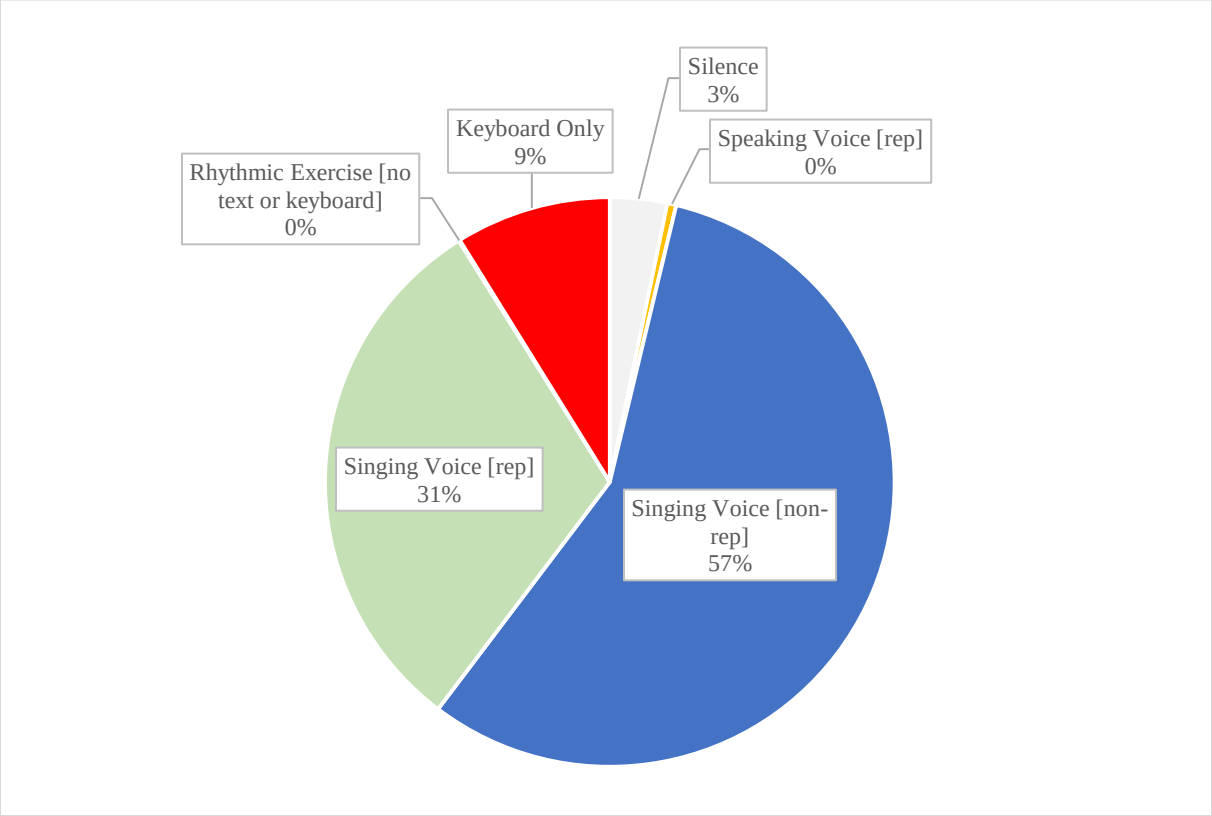

Figure L127. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 22.

Figures L128 – L132 present the chronological order of observed behavioral categories for each individual session by Participant 22.

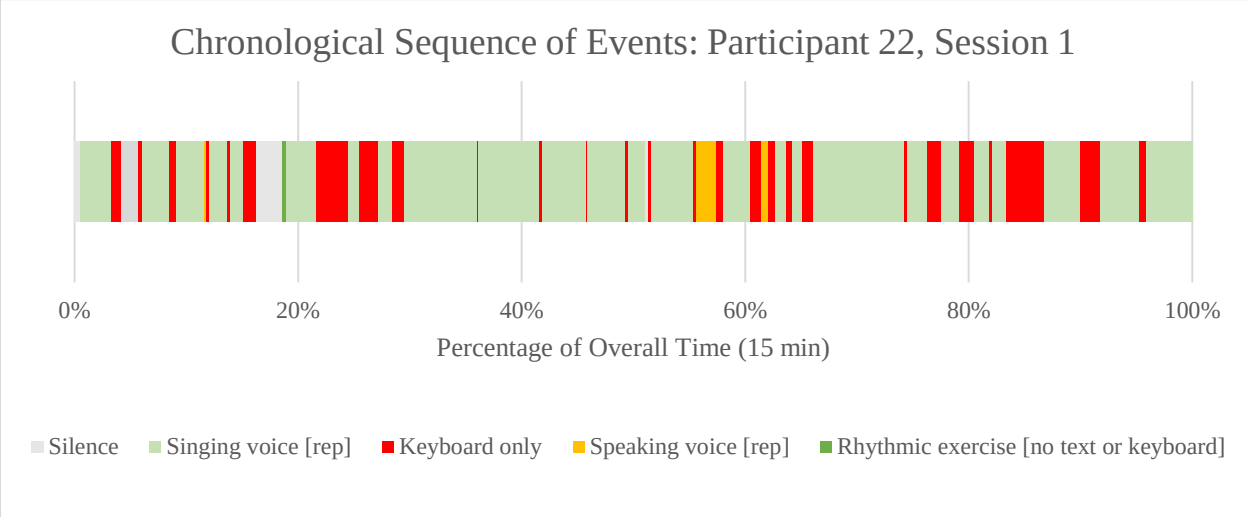

Figure L128. Chronological order of observed behavioral categories: Participant 22, Session 1.

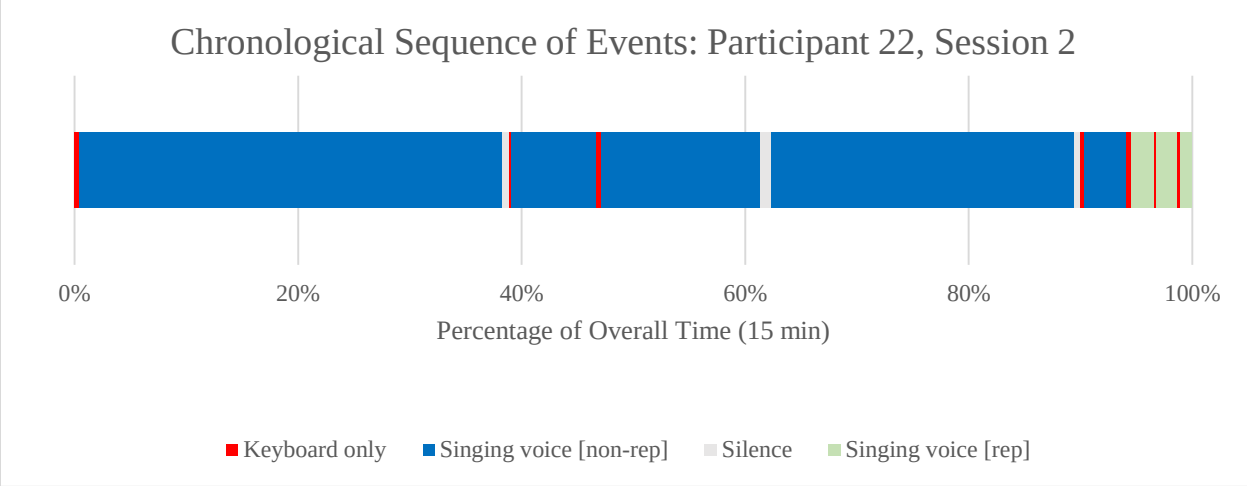

Figure L129. Chronological order of observed behavioral categories: Participant 22, Session 2.

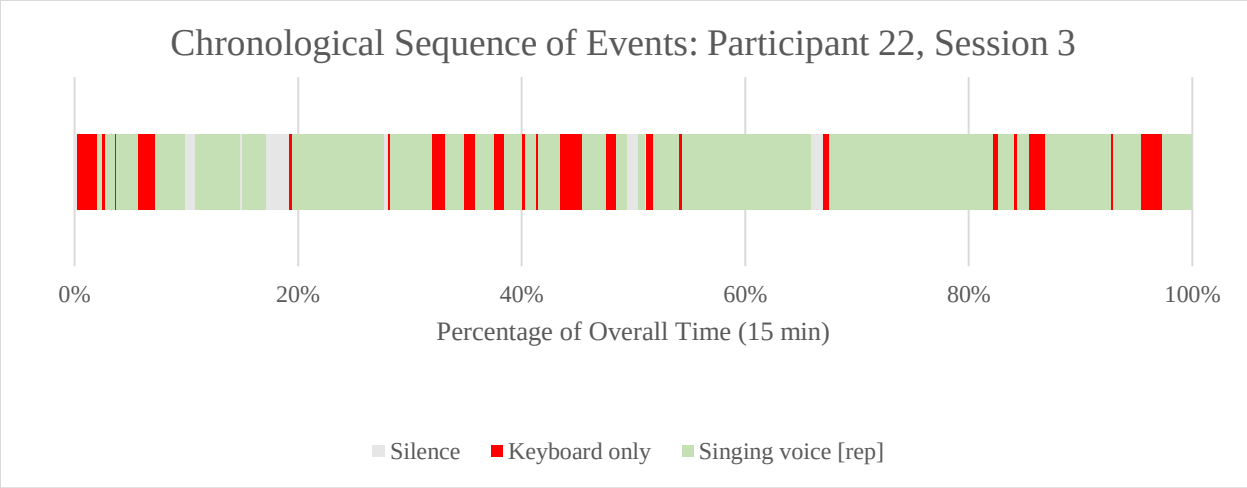

Figure L130. Chronological order of observed behavioral categories: Participant 22, Session 3.

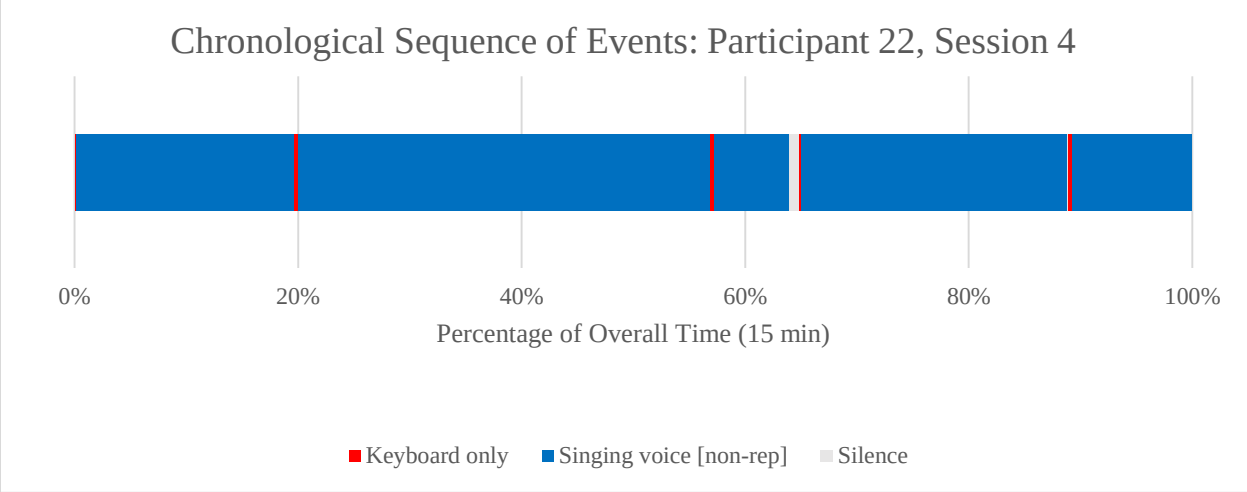

Figure L131. Chronological order of observed behavioral categories: Participant 22, Session 4.

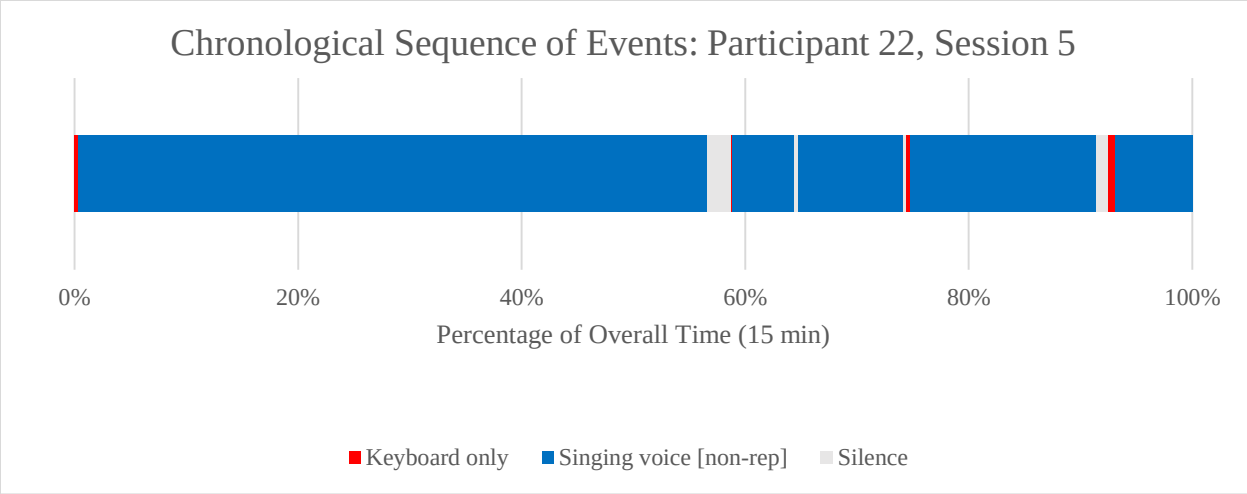

Figure L132. Chronological order of observed behavioral categories: Participant 22, Session 5.

Participant 23. Figure L133 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 23.

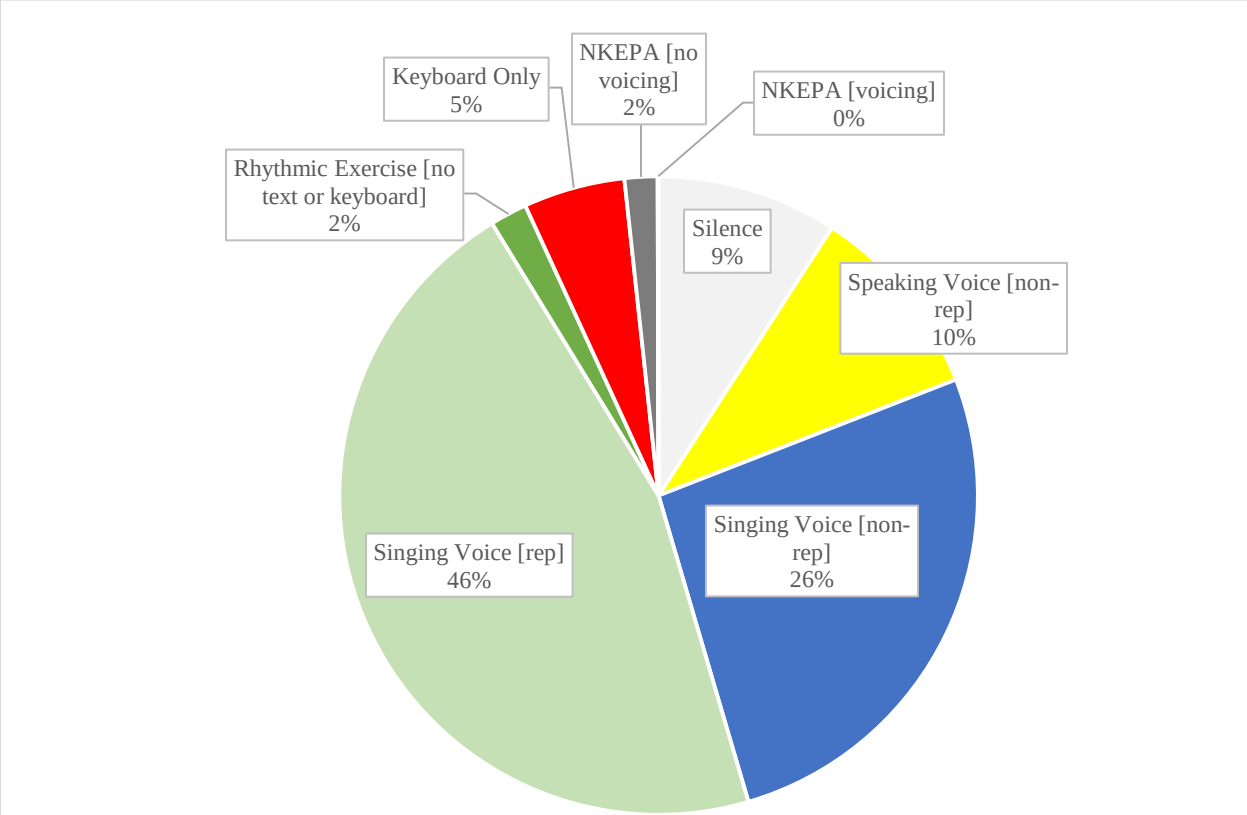

Figure L133. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 23.

Figures L134 – L138 present the chronological order of observed behavioral categories for each individual session by Participant 23.

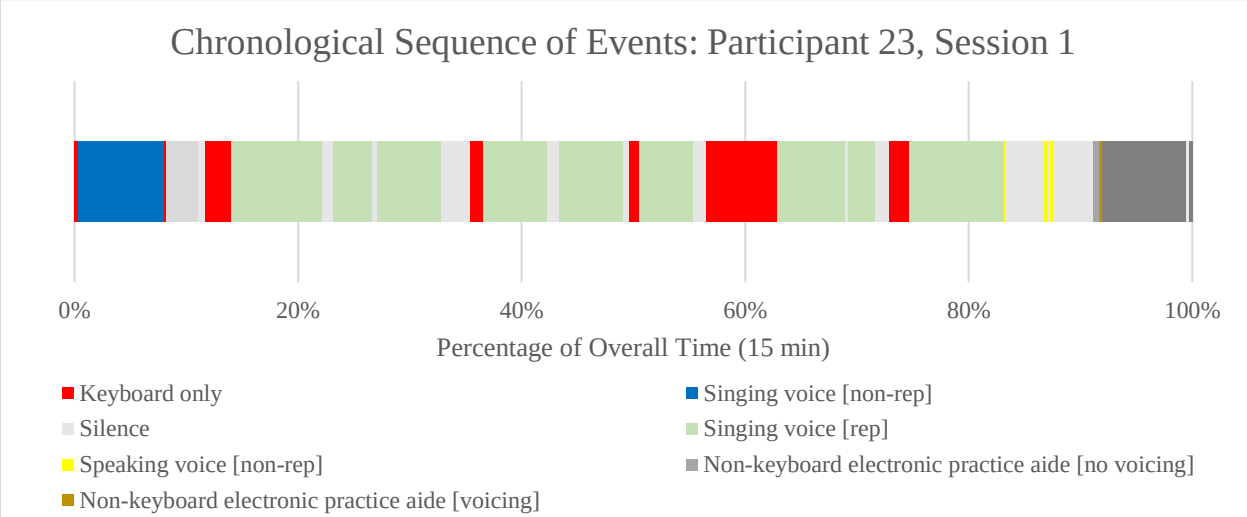

Figure L134. Chronological order of observed behavioral categories: Participant 23, Session 1.

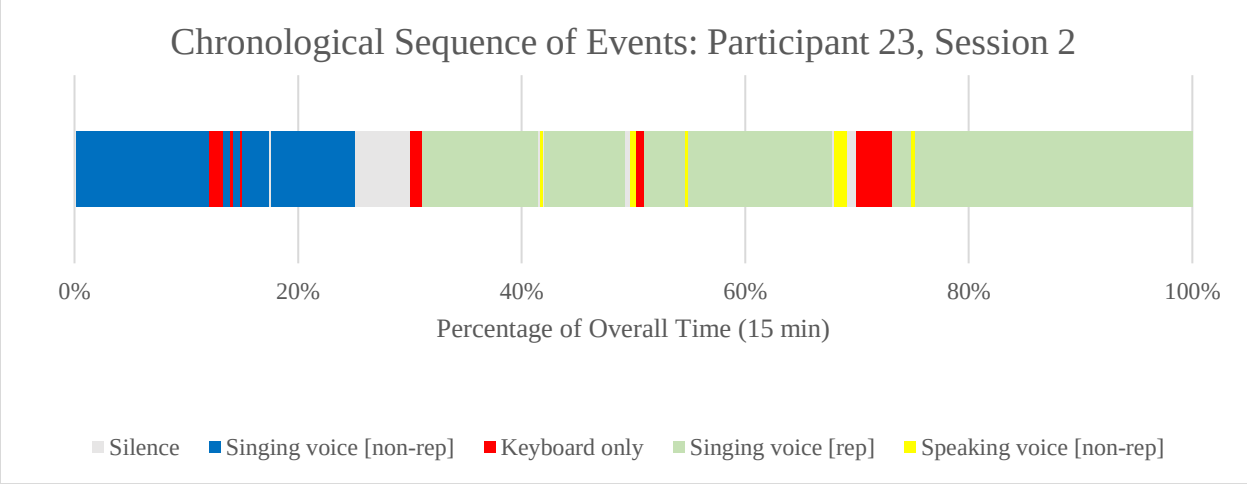

Figure L135. Chronological order of observed behavioral categories: Participant 23, Session 2.

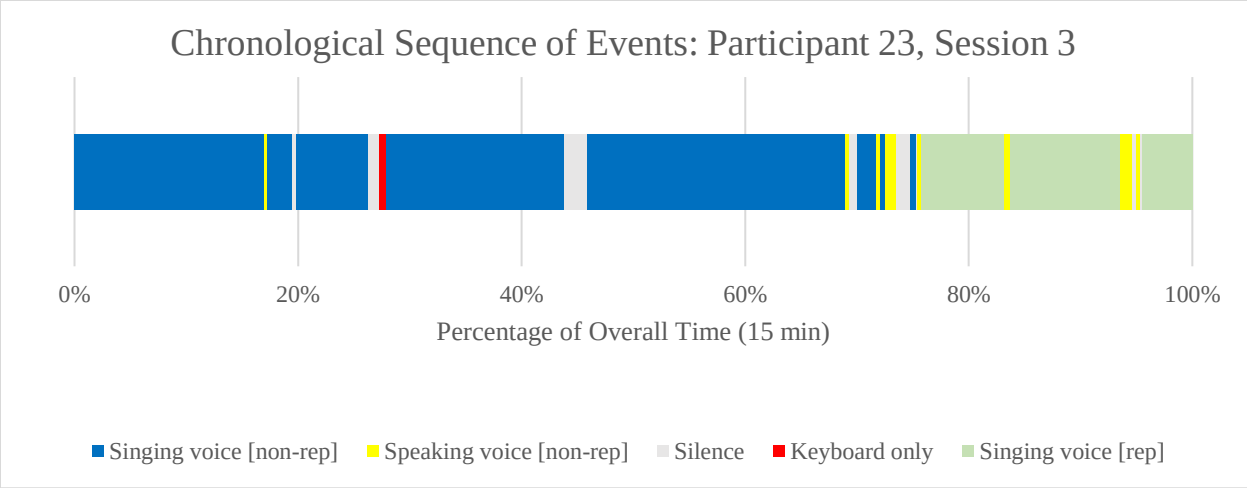

Figure L136. Chronological order of observed behavioral categories: Participant 23, Session 3.

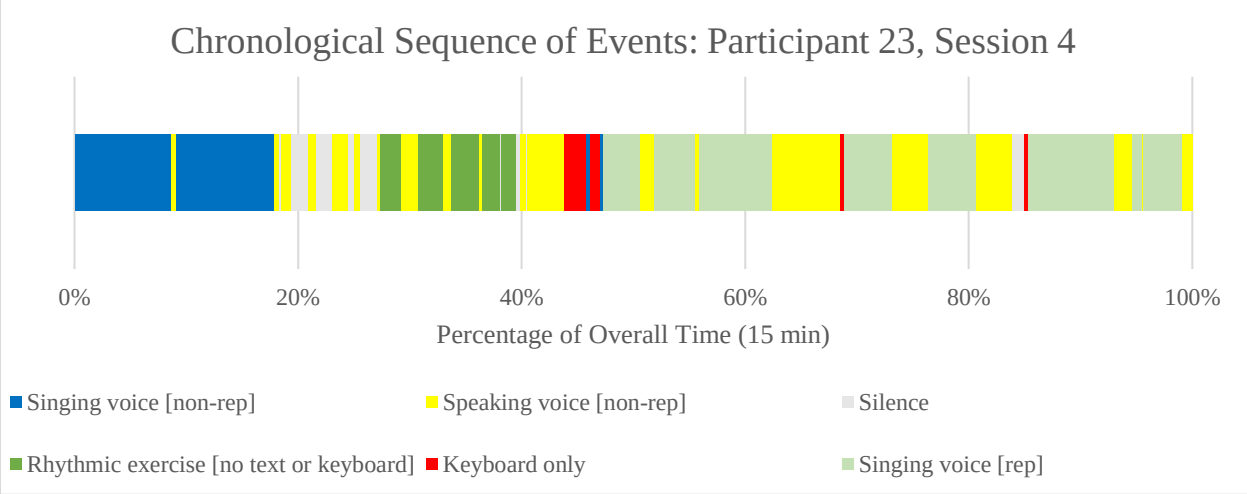

Figure L137. Chronological order of observed behavioral categories: Participant 23, Session 4.

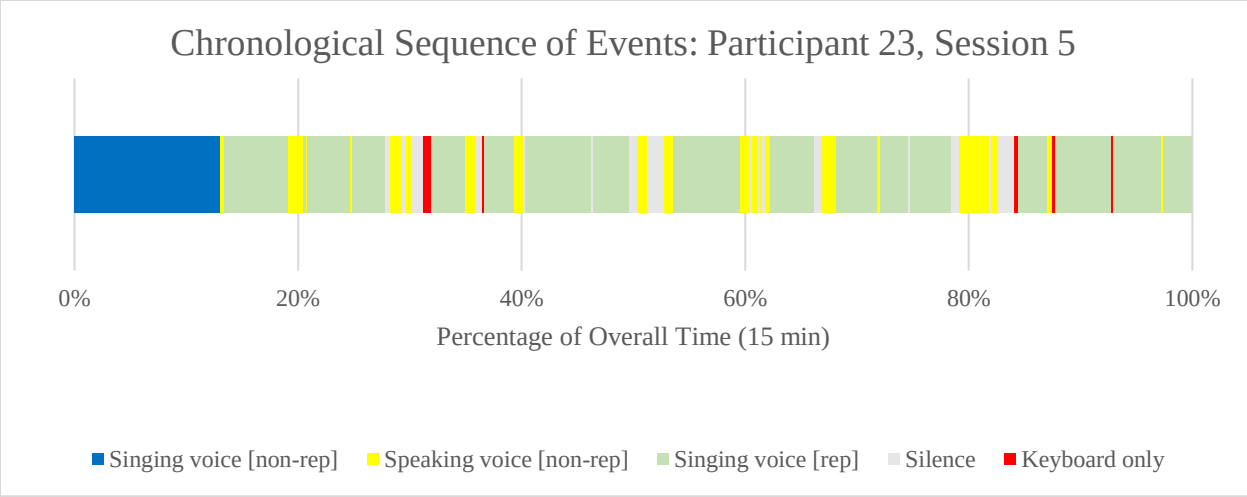

Figure L138. Chronological order of observed behavioral categories: Participant 23, Session 5.

Participant 24. Figure L139 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 24.

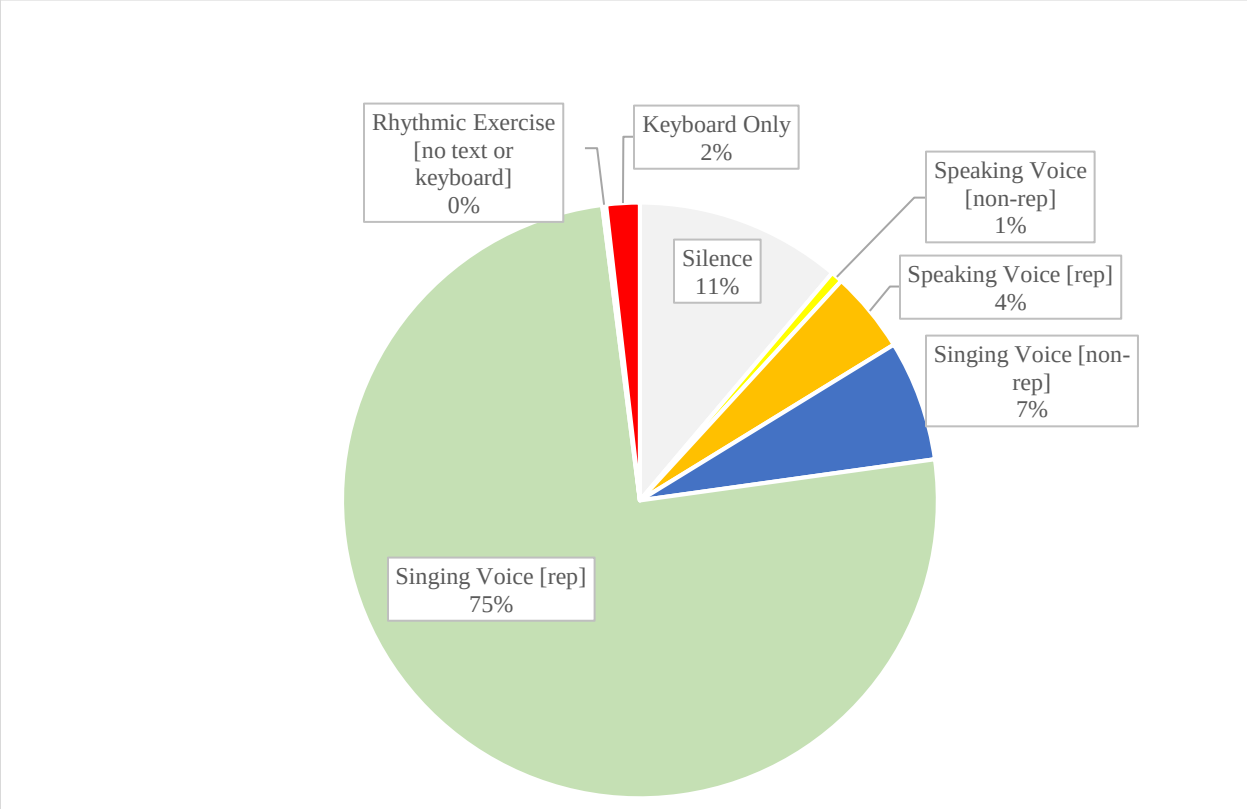

Figure L139. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 24.

Figures L140 – L144 present the chronological order of observed behavioral categories for each individual session by Participant 24.

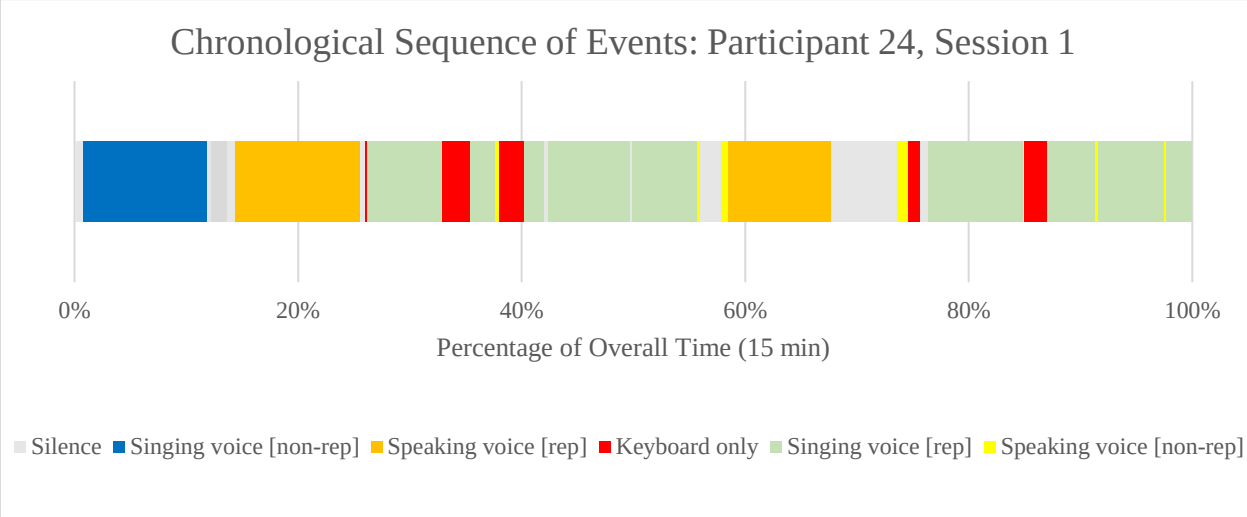

Figure L140. Chronological order of observed behavioral categories: Participant 24, Session 1.

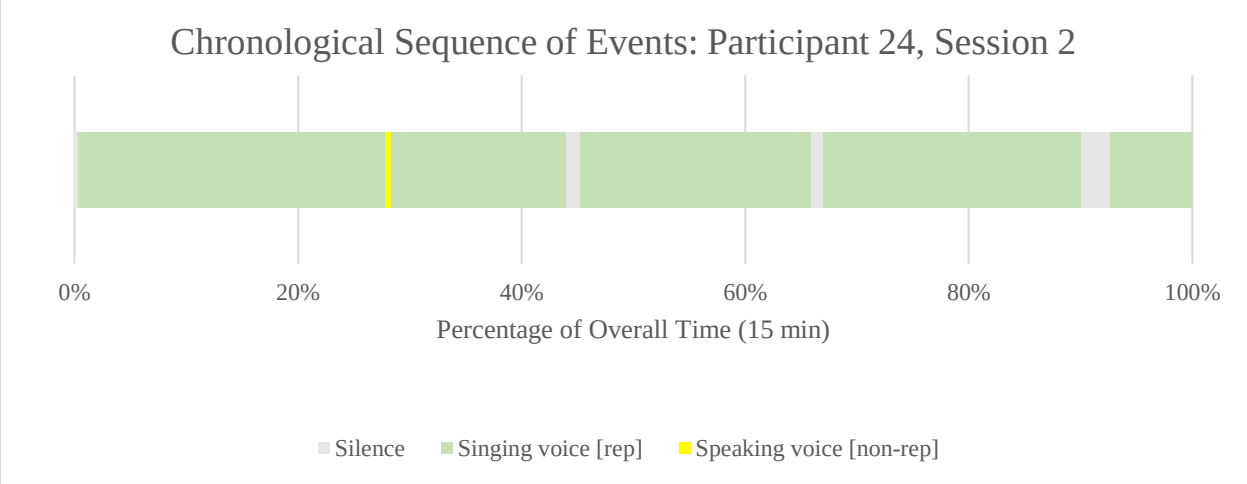

Figure L141. Chronological order of observed behavioral categories: Participant 24, Session 2.

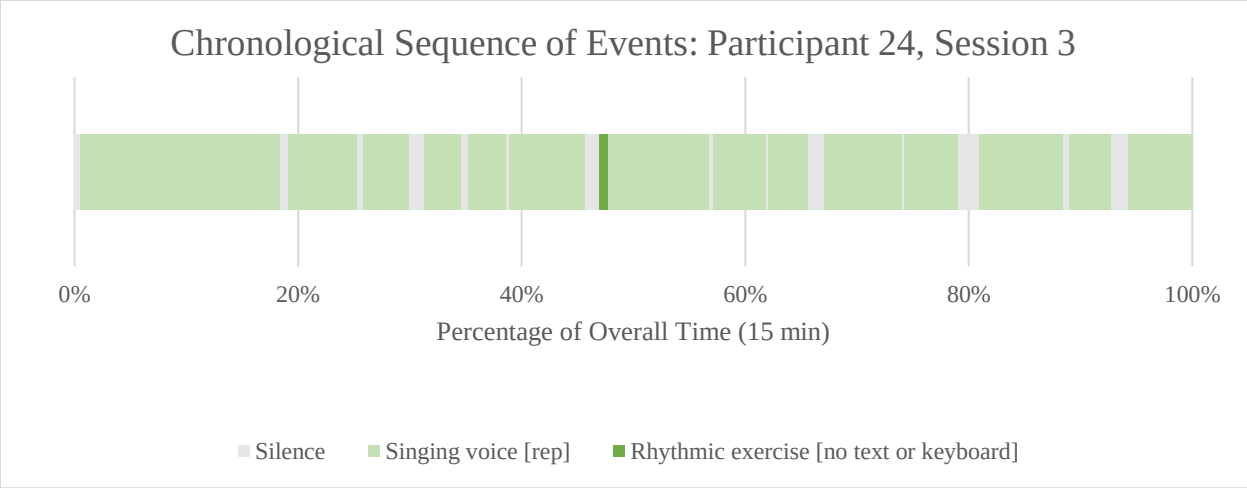

Figure L142. Chronological order of observed behavioral categories: Participant 24, Session 3.

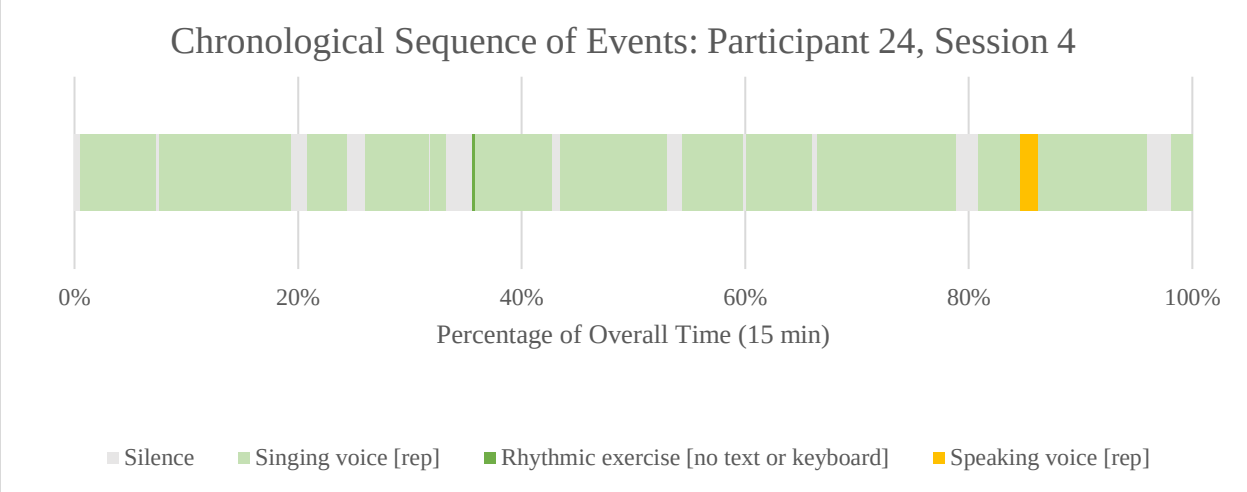

Figure L143. Chronological order of observed behavioral categories: Participant 24, Session 4.

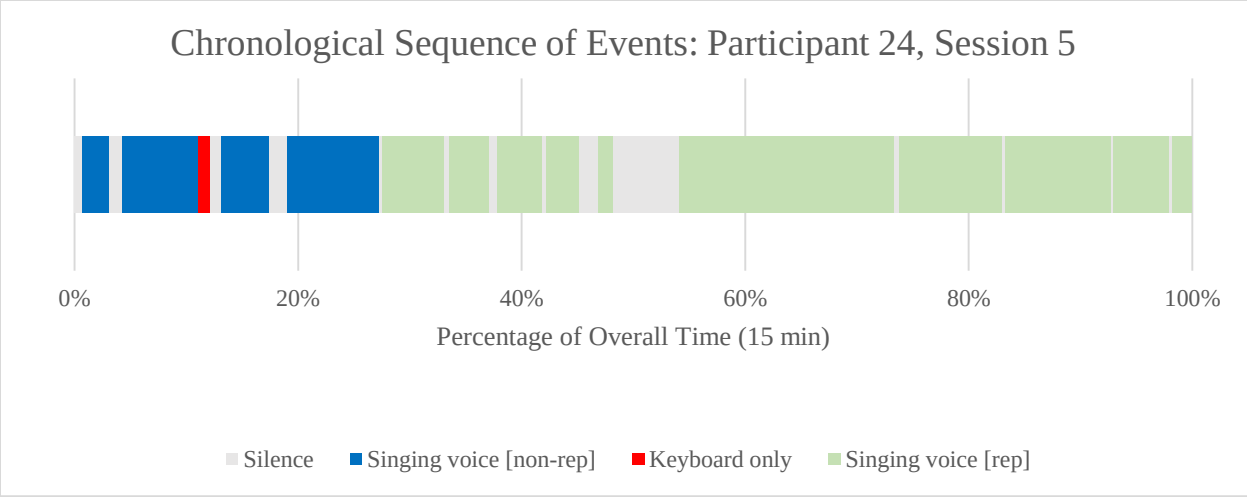

Figure L144. Chronological order of observed behavioral categories: Participant 24, Session 5.

Participant 25. Figure L145 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 25.

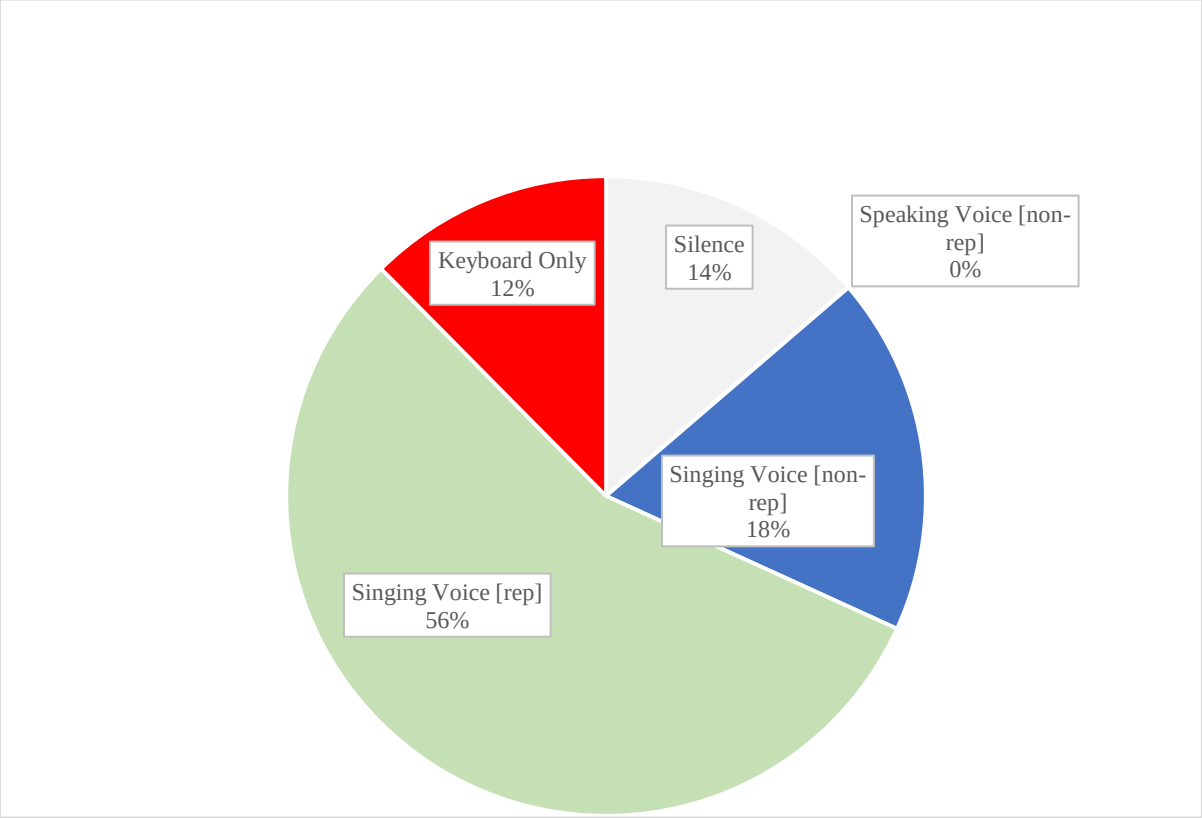

Figure L145. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 25.

Figures L146 – L150 present the chronological order of observed behavioral categories for each individual session by Participant 25.

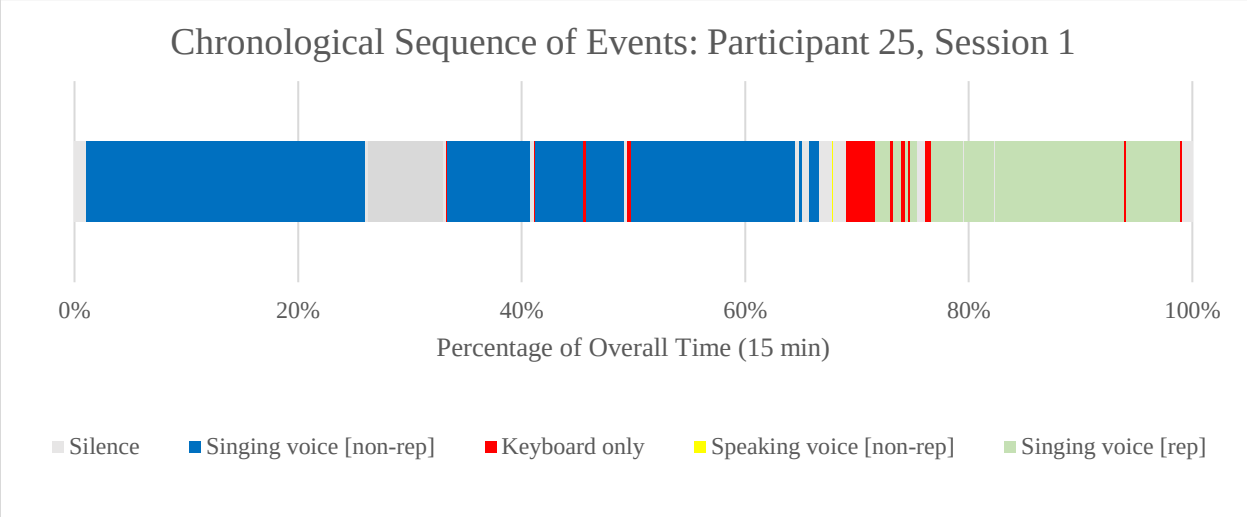

Figure L146. Chronological order of observed behavioral categories: Participant 25, Session 1.

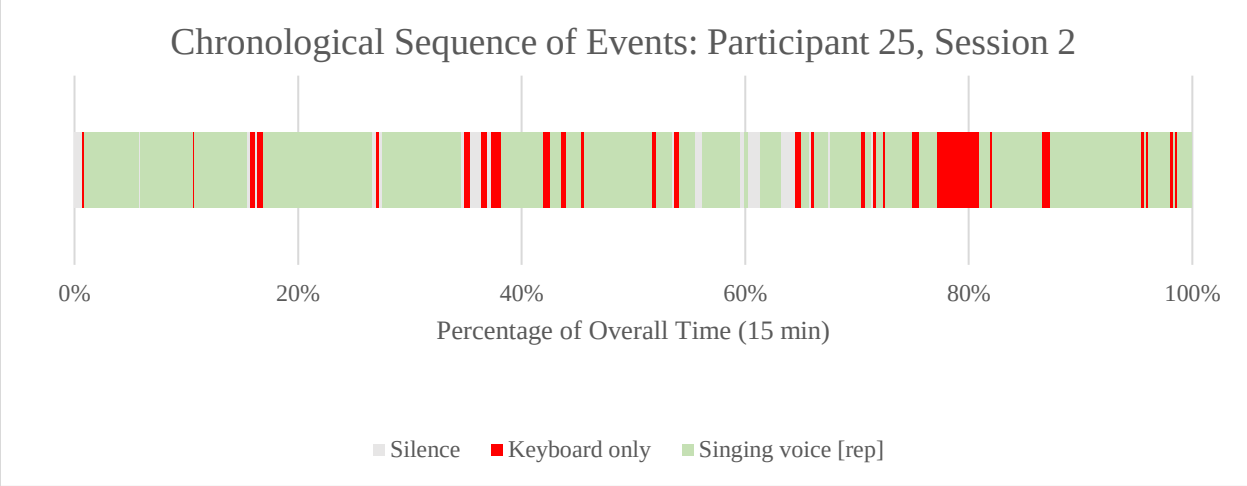

Figure L147. Chronological order of observed behavioral categories: Participant 25, Session 2.

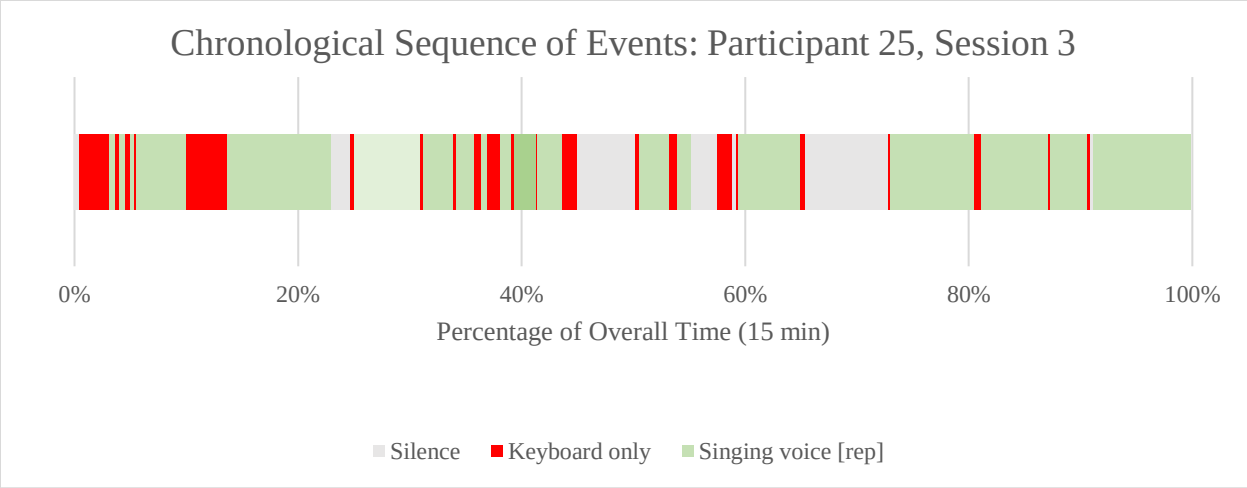

Figure L148. Chronological order of observed behavioral categories: Participant 25, Session 3.

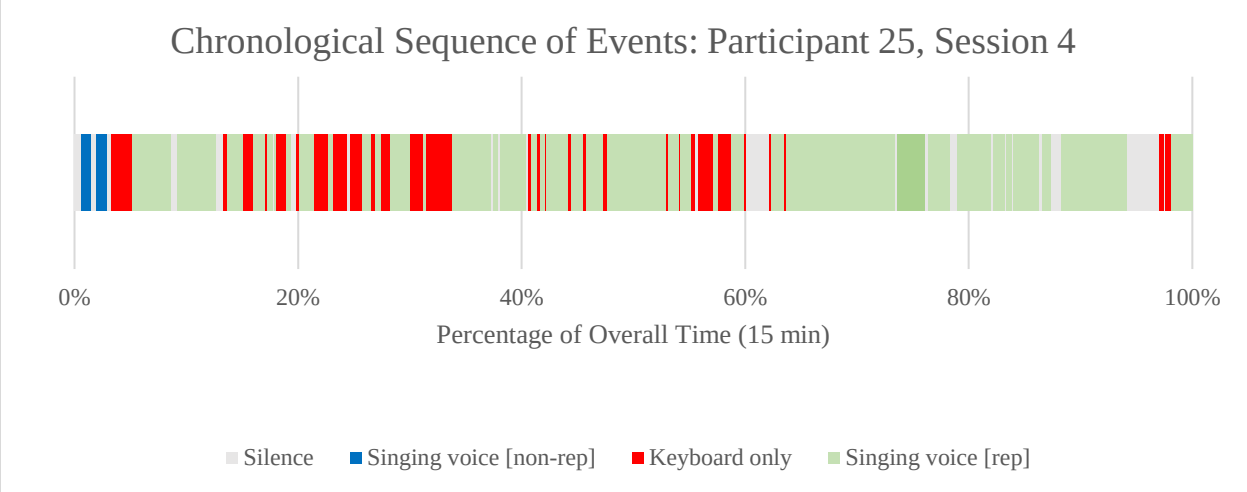

Figure L149. Chronological order of observed behavioral categories: Participant 25, Session 4.

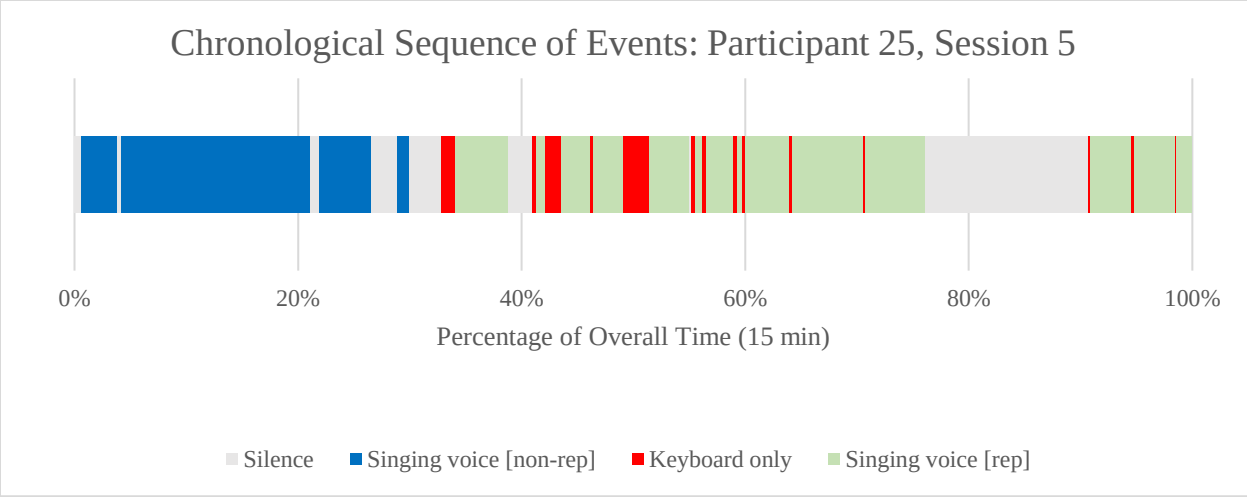

Figure L150. Chronological order of observed behavioral categories: Participant 25, Session 5.

Participant 26. Figure L151 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 26.

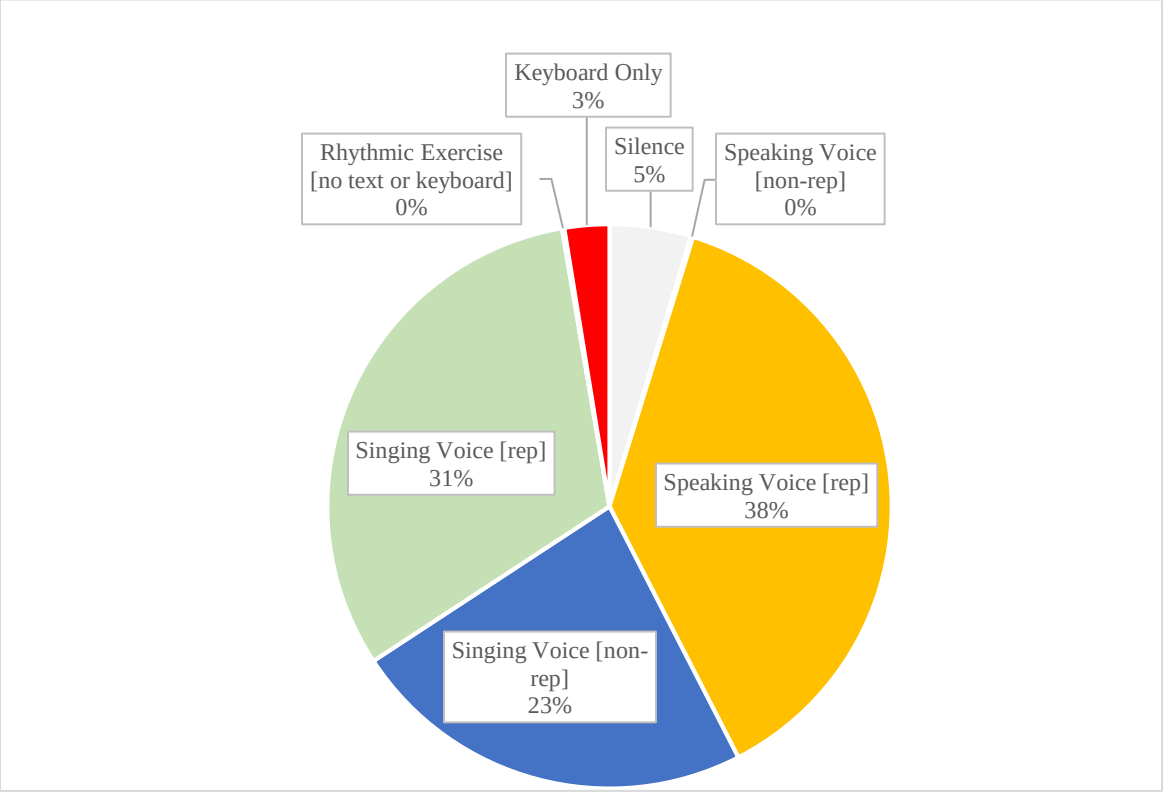

Figure L151. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 26.

Figure L152 – L156 present the chronological order of observed behavioral categories for each individual session by Participant 26.

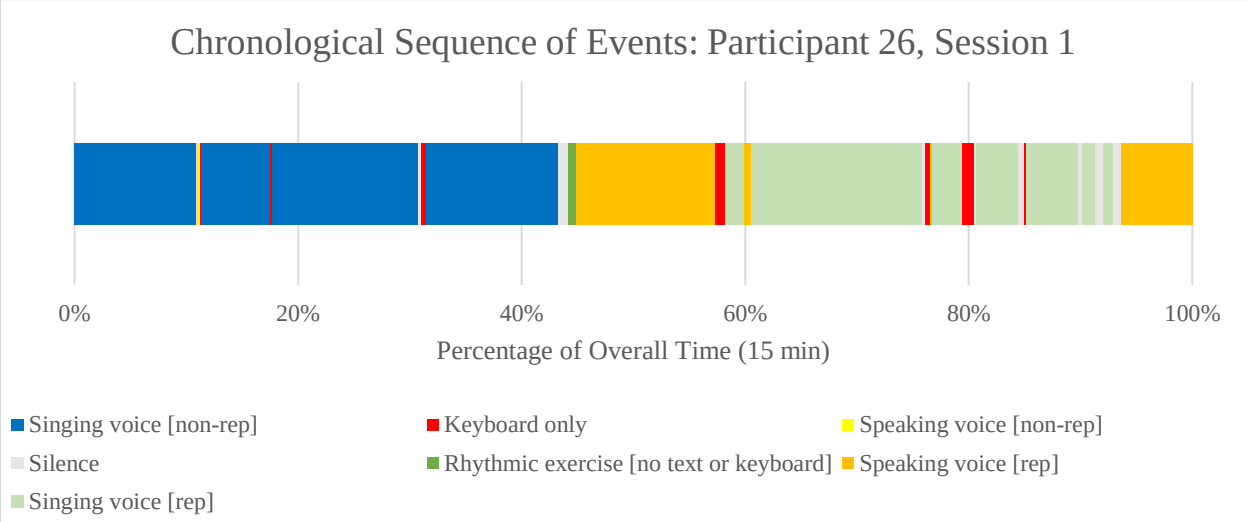

Figure L152. Chronological order of observed behavioral categories: Participant 26, Session 1.

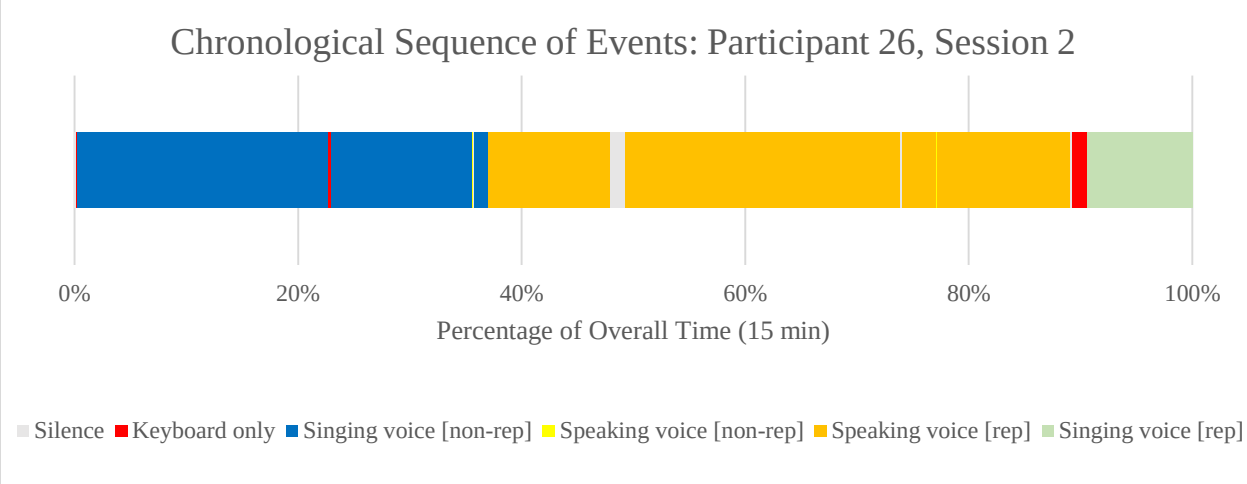

Figure L153. Chronological order of observed behavioral categories: Participant 26, Session 2.

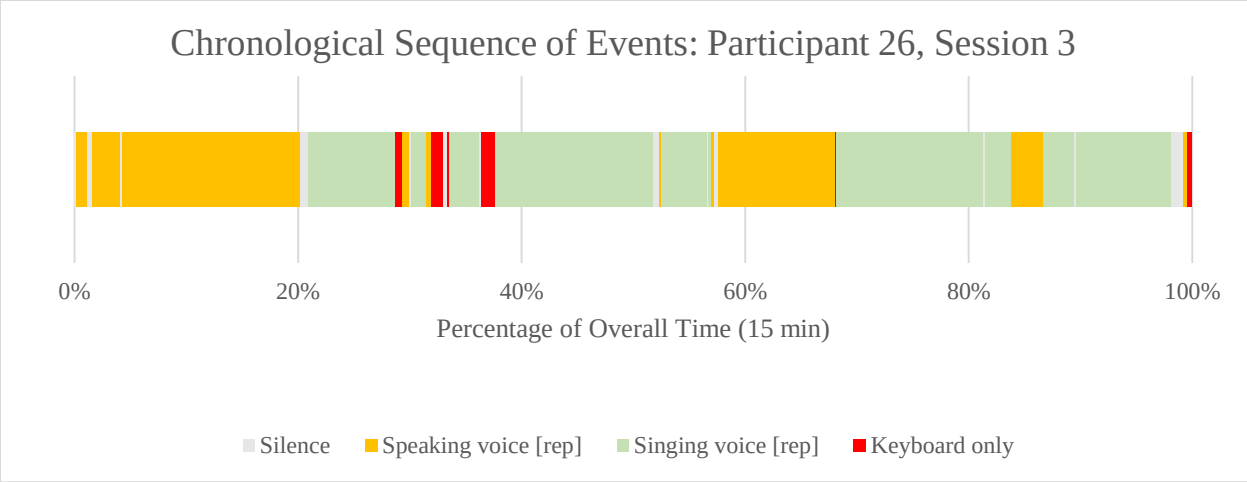

Figure L154. Chronological order of observed behavioral categories: Participant 26, Session 3.

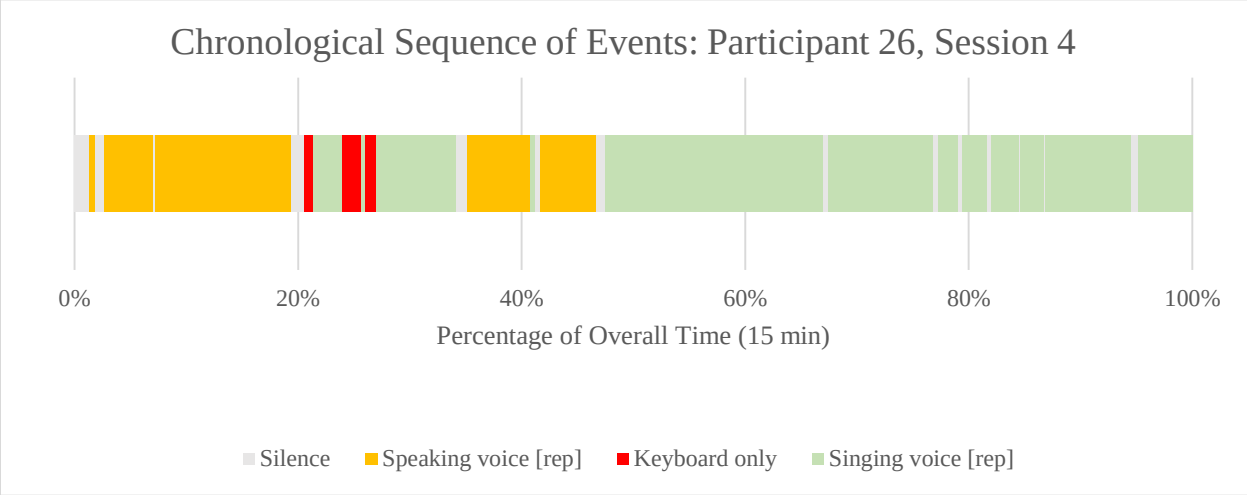

Figure L155. Chronological order of observed behavioral categories: Participant 26, Session 4.

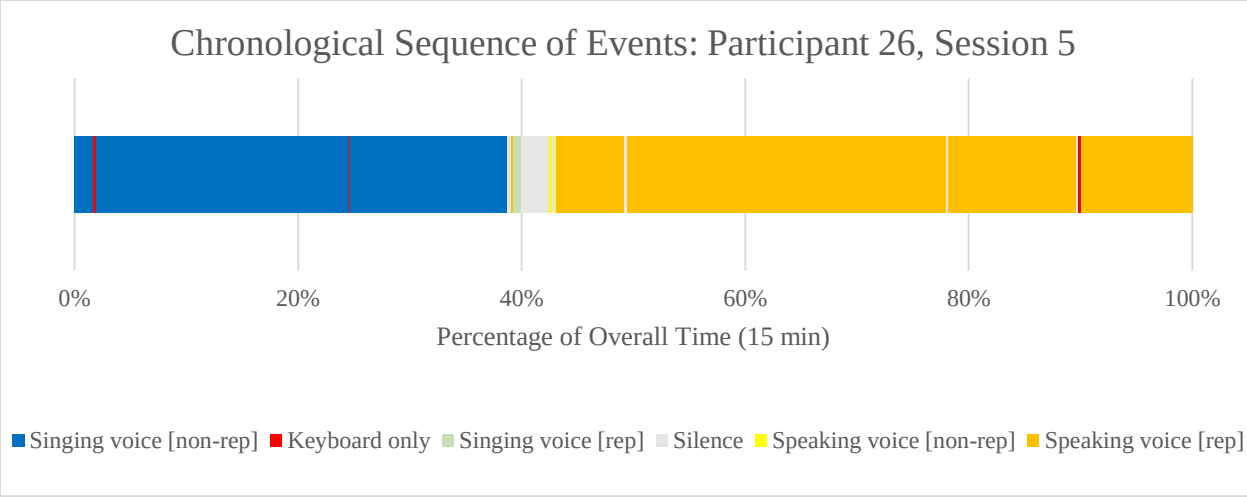

Figure L156. Chronological order of observed behavioral categories: Participant 26, Session 5.

Participant 27. Figure L157 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 27.

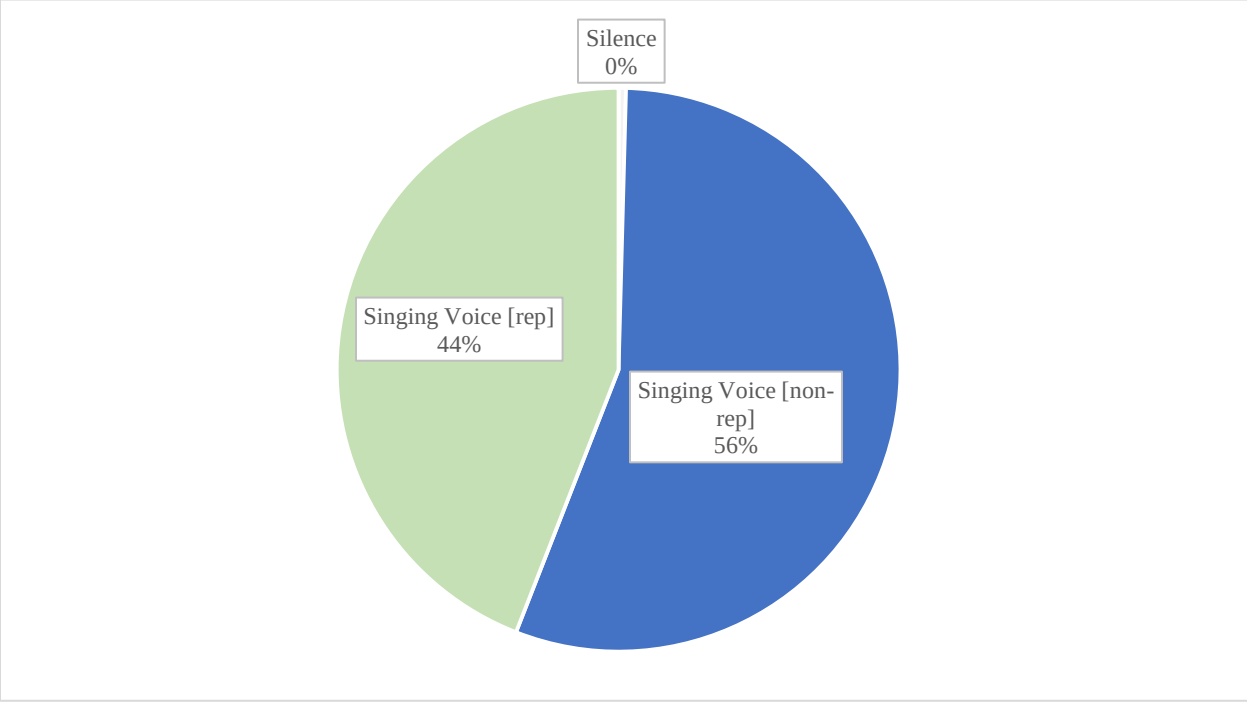

Figure L157. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 27.

Figure L158 – L162 present the chronological order of observed behavioral categories for each individual session by Participant 27.

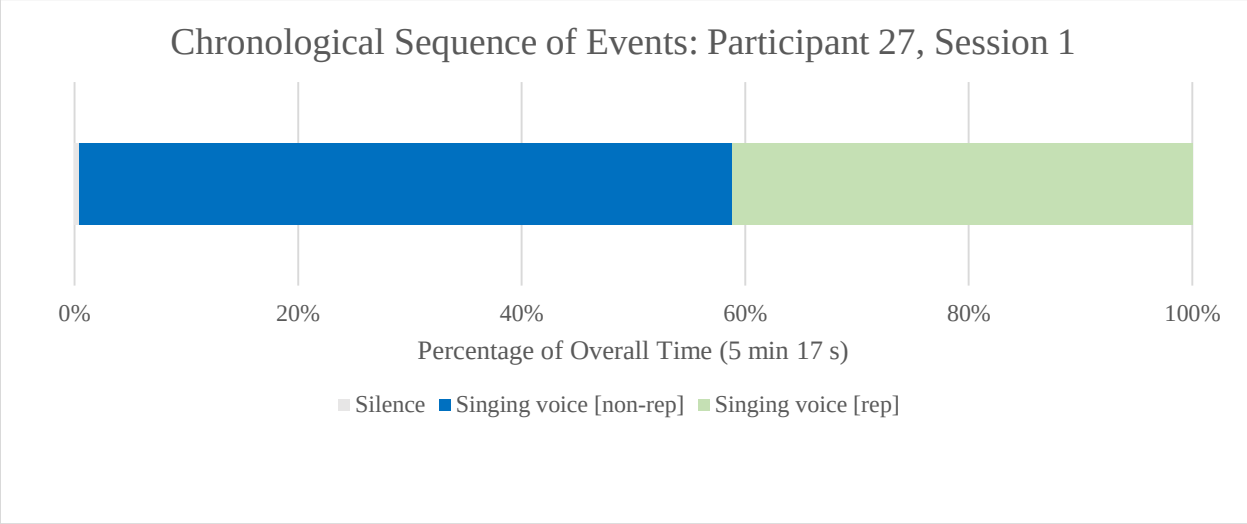

Figure L158. Chronological order of observed behavioral categories: Participant 27, Session 1.

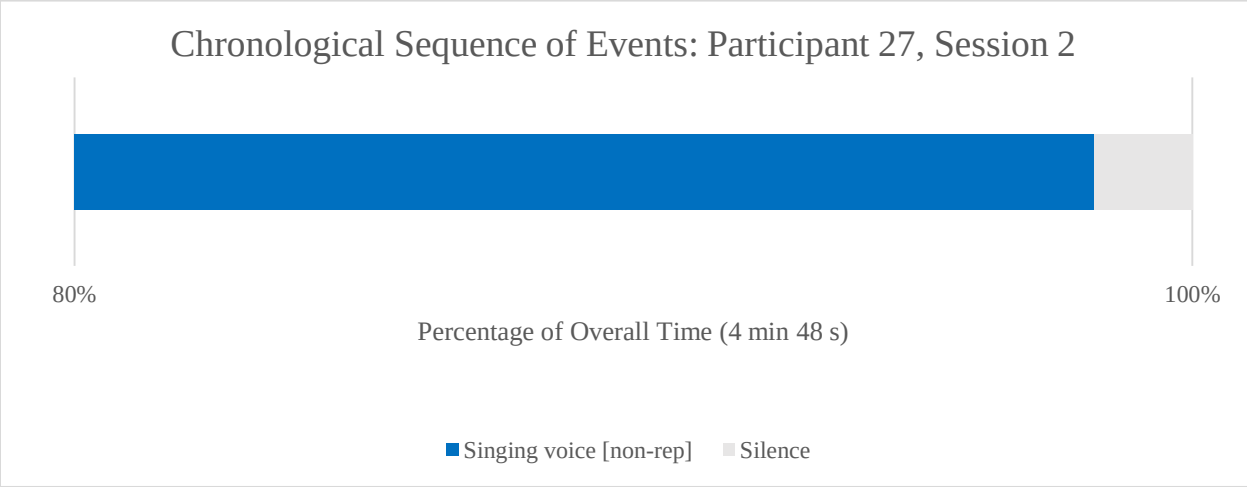

Figure L159. Chronological order of observed behavioral categories: Participant 27, Session 2.

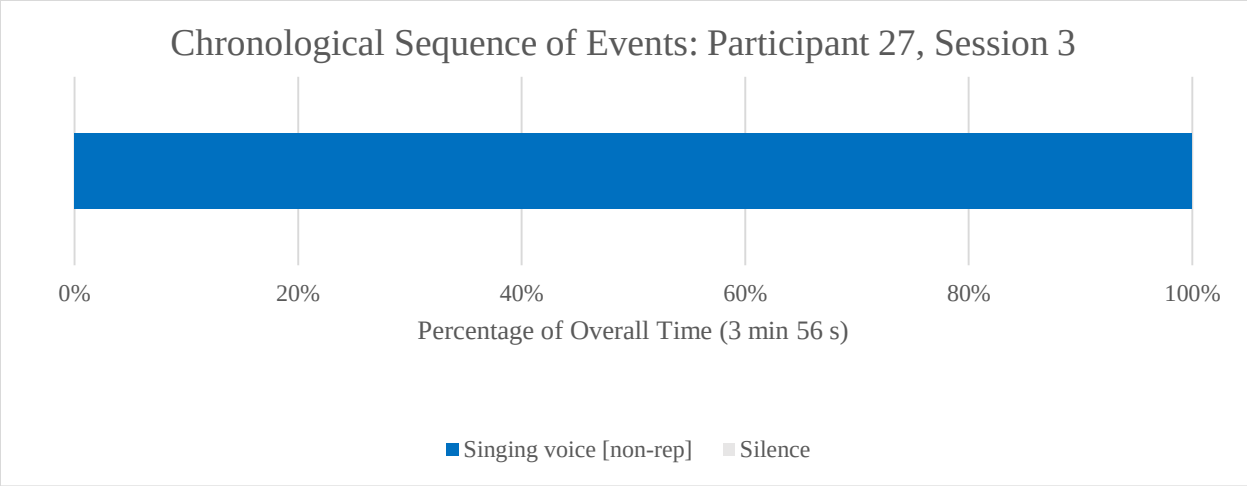

Figure L160. Chronological order of observed behavioral categories: Participant 27, Session 3.

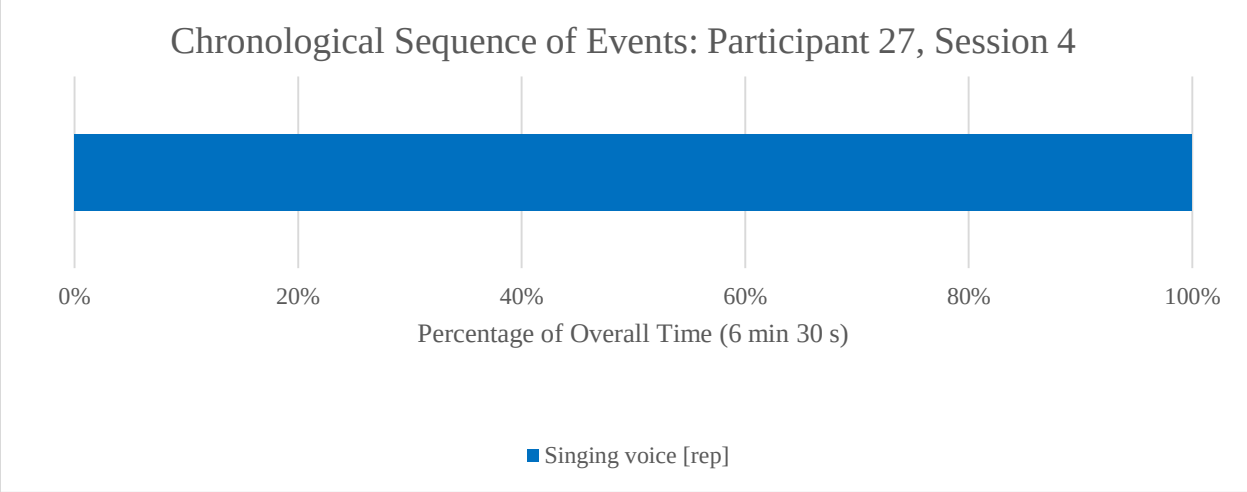

Figure L161. Chronological order of observed behavioral categories: Participant 27, Session 4.

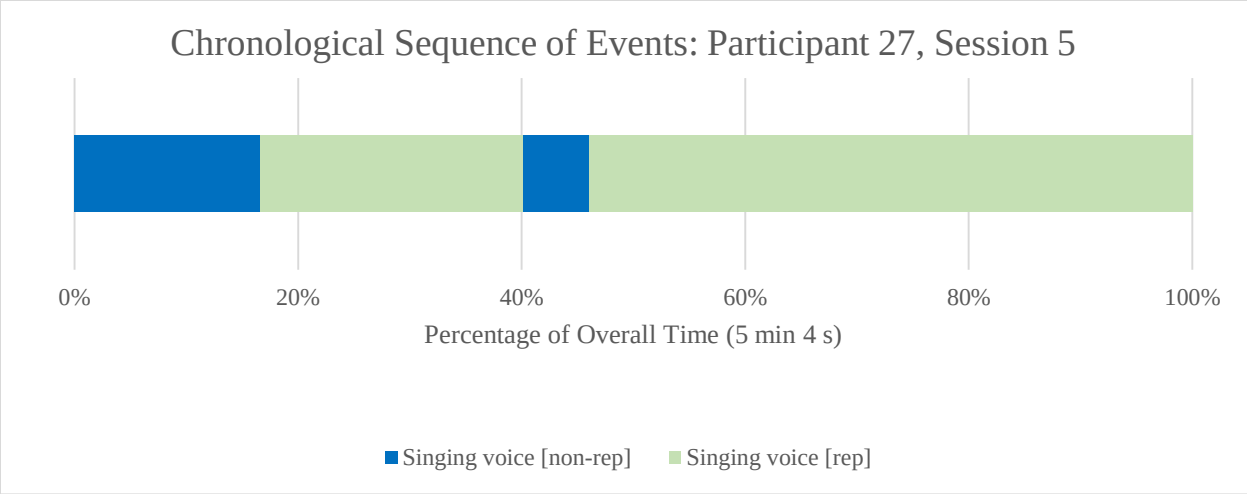

Figure L162. Chronological order of observed behavioral categories: Participant 27, Session 5.

Participant 28. Figure L163 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 28.

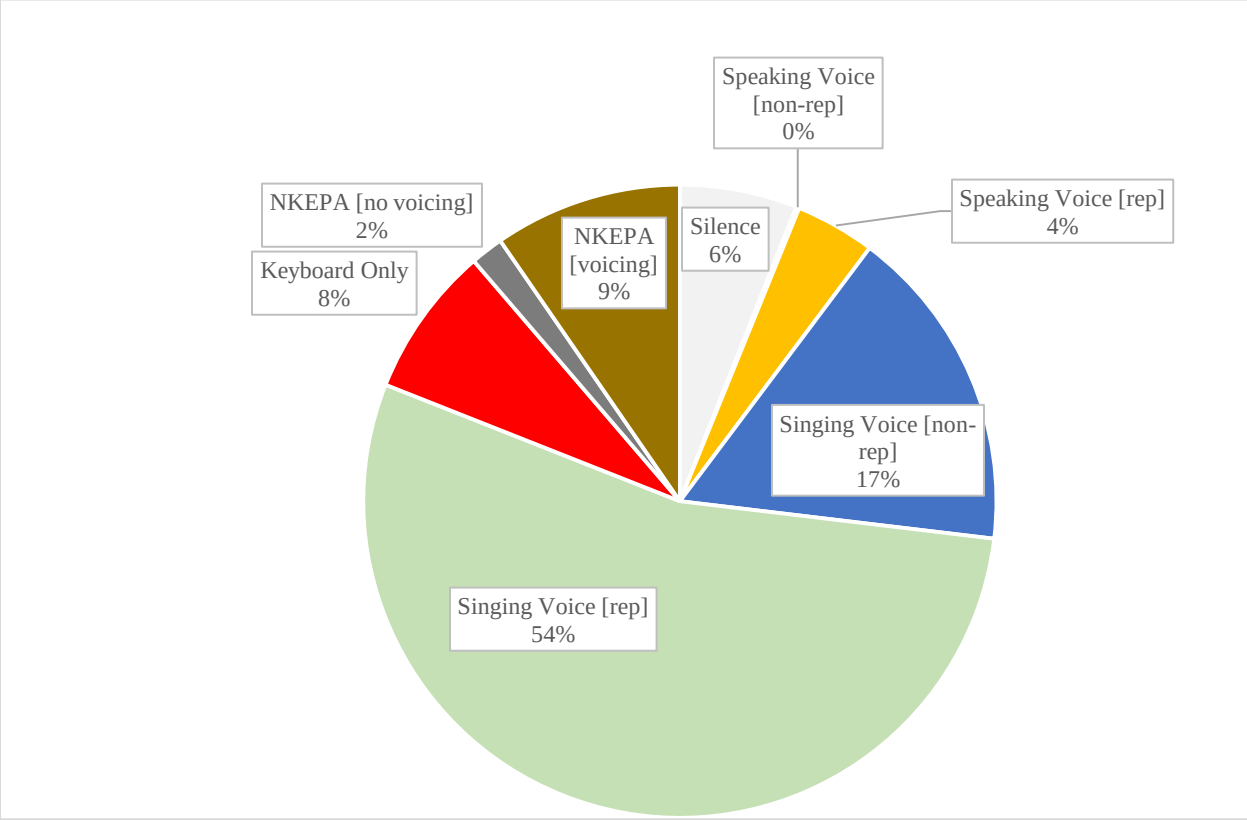

Figure L163. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 28.

Figures L164 – L168 present the chronological order of observed behavioral categories for each individual session by Participant 28.

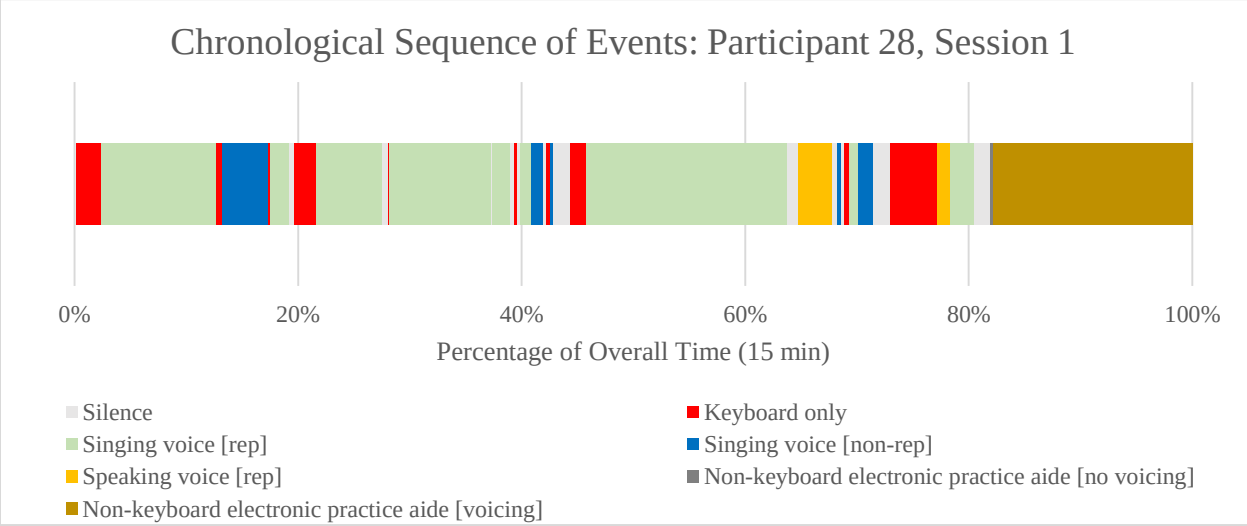

Figure L164. Chronological order of observed behavioral categories: Participant 28, Session 1.

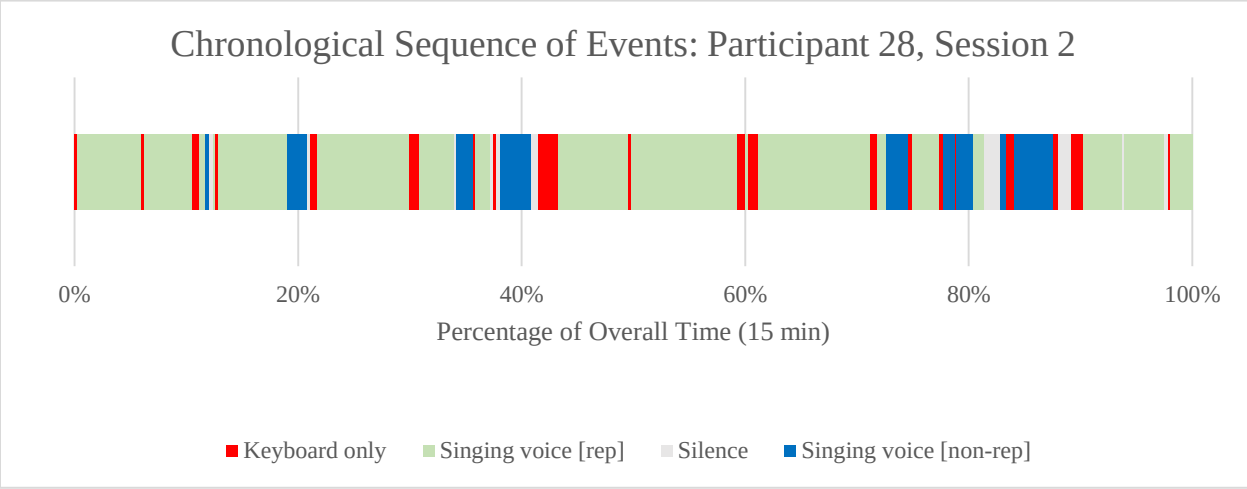

Figure L165. Chronological order of observed behavioral categories: Participant 28, Session 2.

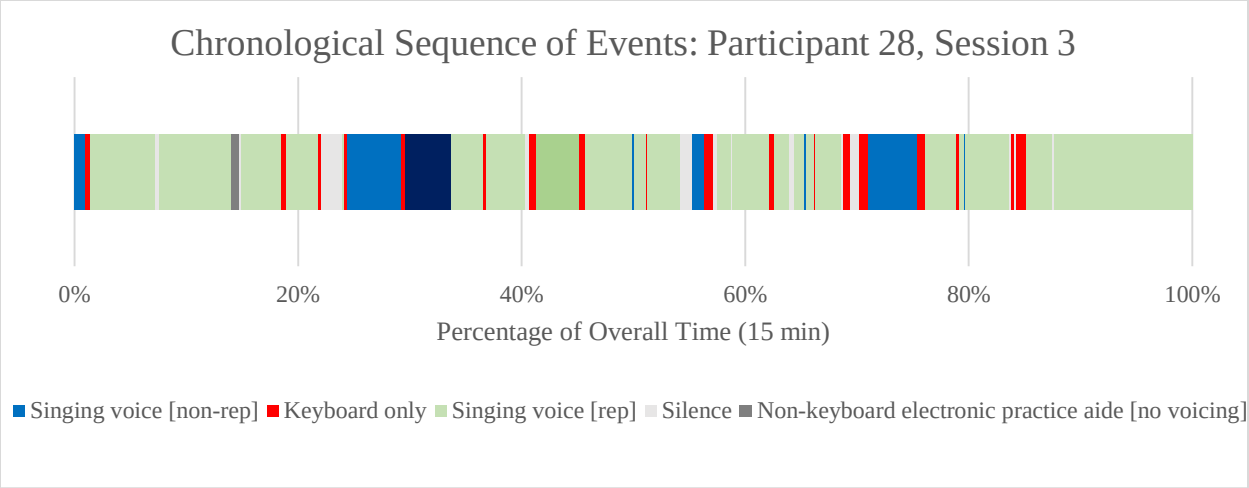

Figure L166. Chronological order of observed behavioral categories: Participant 28, Session 3.

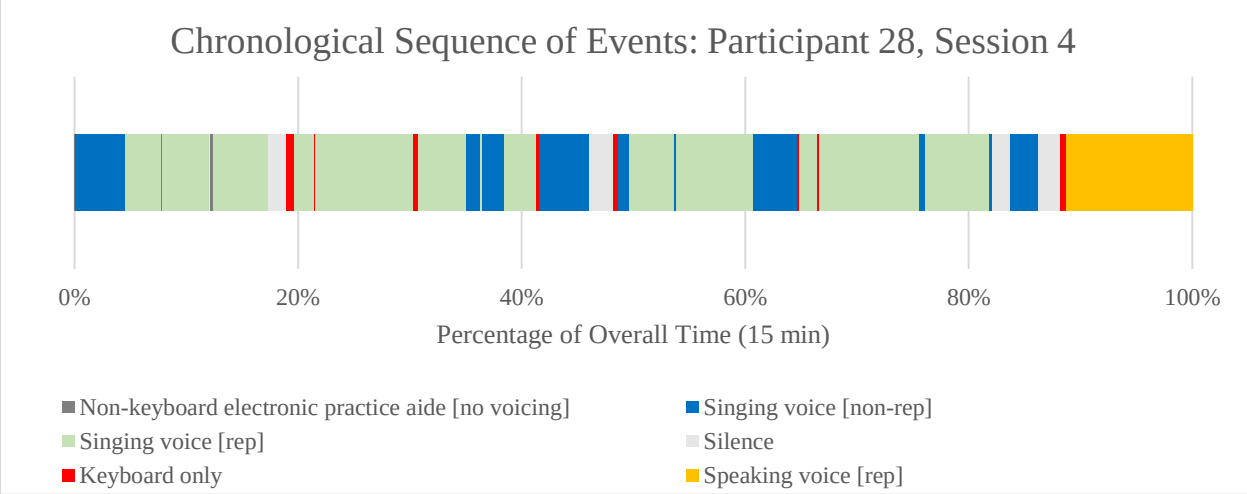

Figure L167. Chronological order of observed behavioral categories: Participant 28, Session 4.

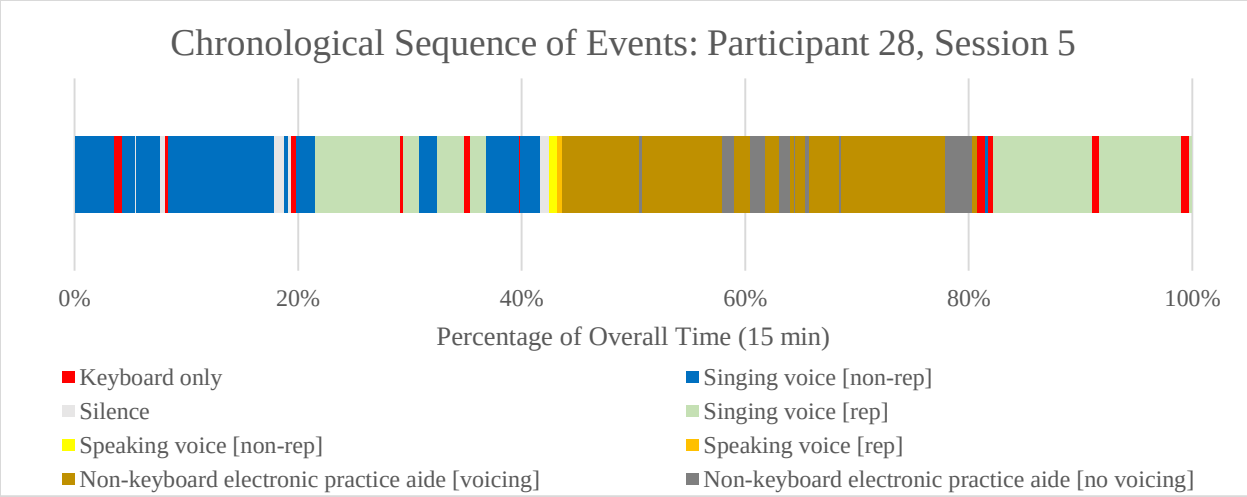

Figure L168. Chronological order of observed behavioral categories: Participant 28, Session 5.

Participant 29. Figure L169 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 29.

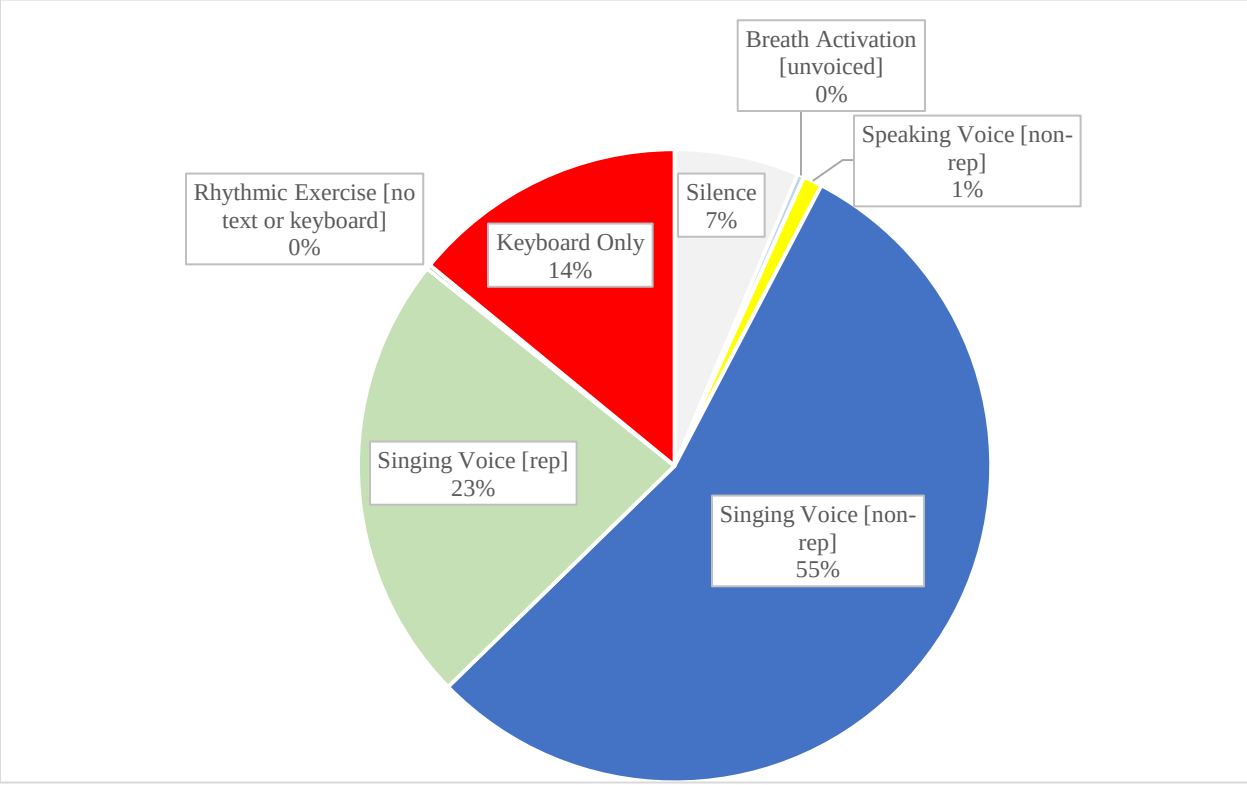

Figure L169. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 29.

Figures L170 – L174 present the chronological order of observed behavioral categories for each individual session by Participant 29.

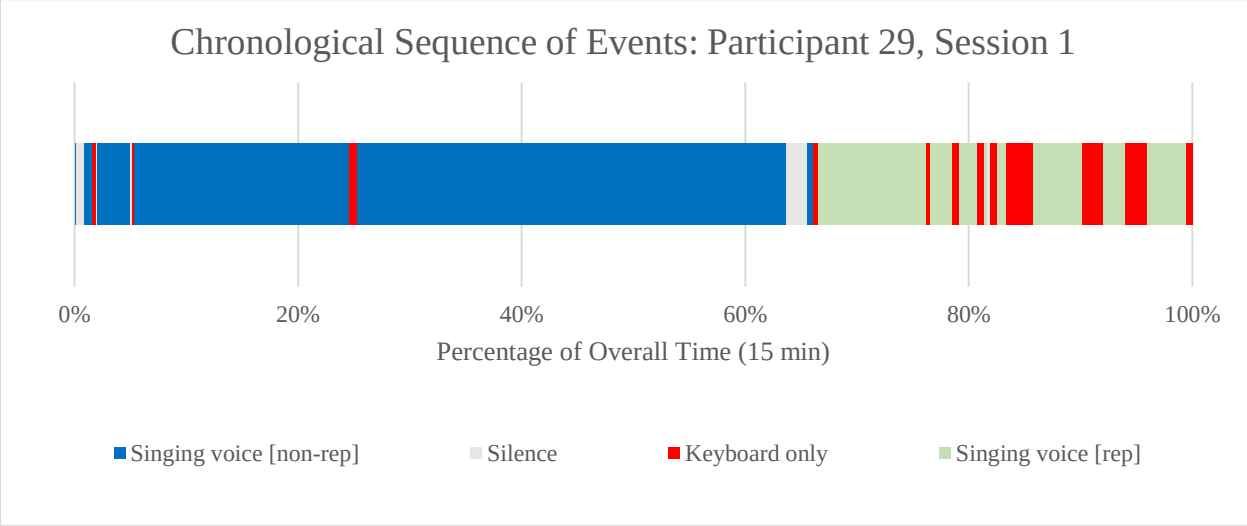

Figure L170. Chronological order of observed behavioral categories: Participant 29, Session 1.

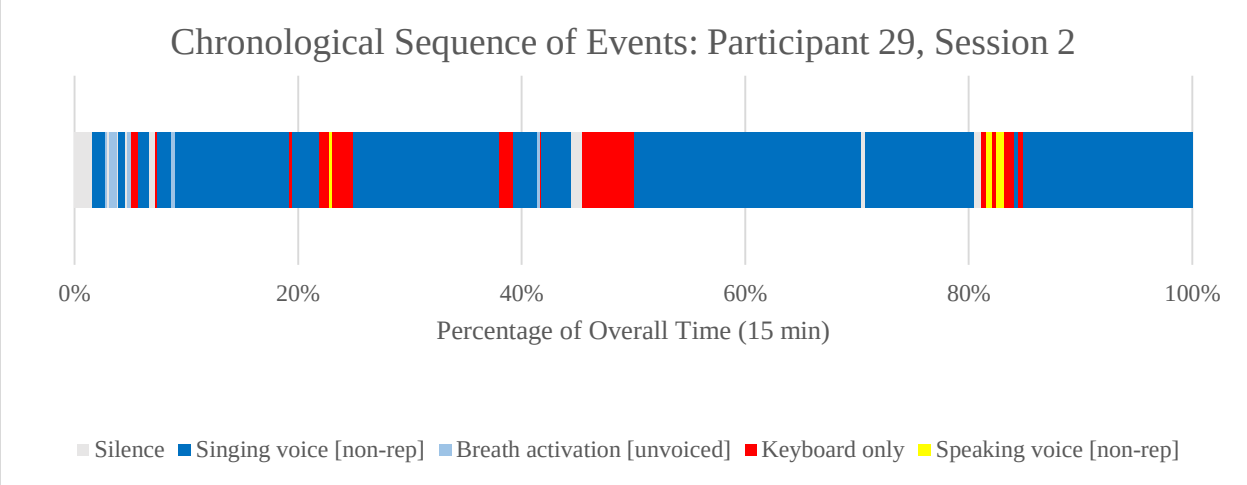

Figure L171. Chronological order of observed behavioral categories: Participant 29, Session 2.

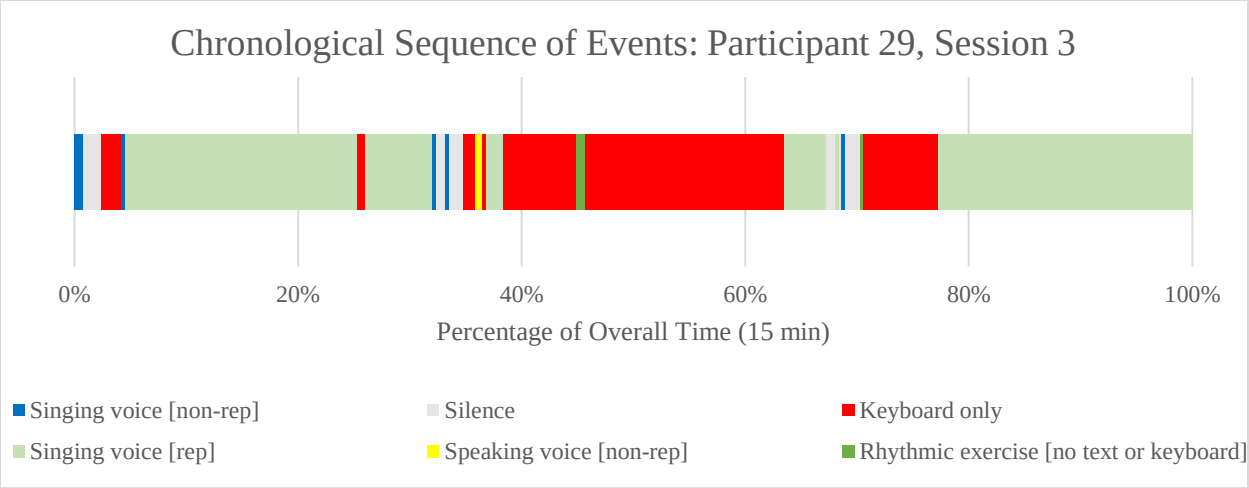

Figure L172. Chronological order of observed behavioral categories: Participant 29, Session 3.

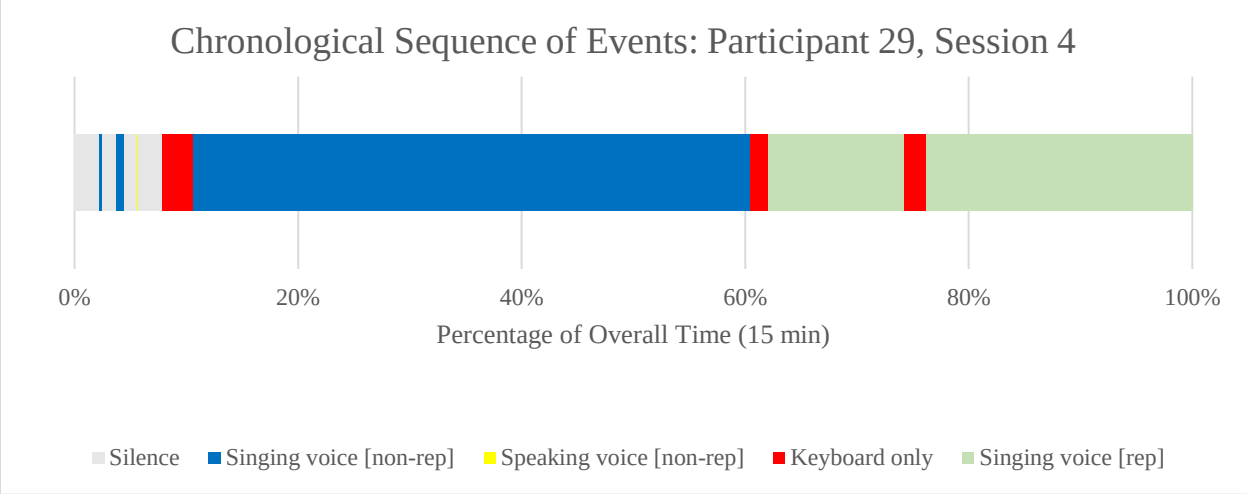

Figure L173. Chronological order of observed behavioral categories: Participant 29, Session 4.

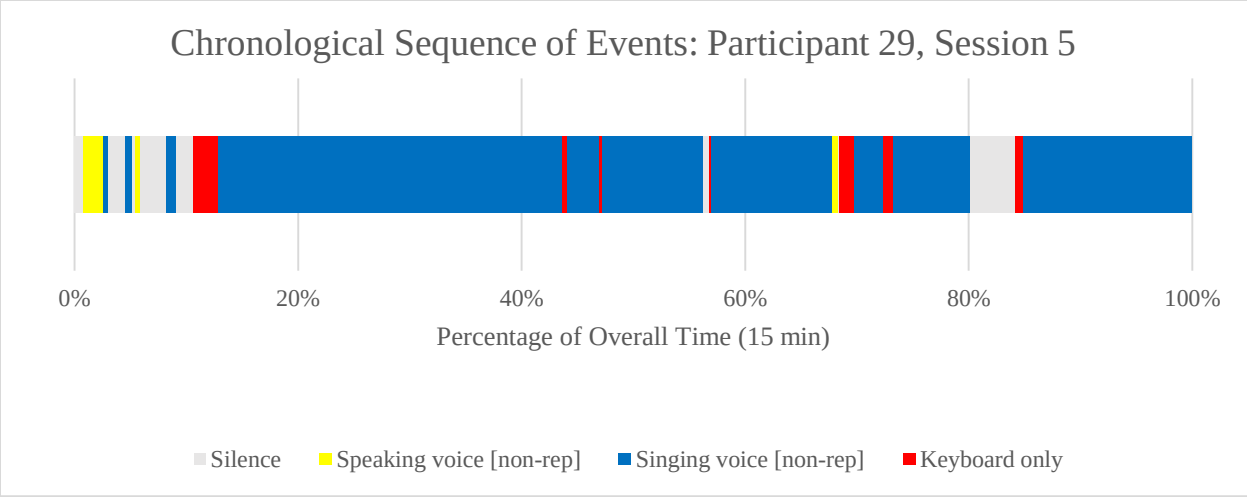

Figure L174. Chronological order of observed behavioral categories: Participant 29, Session 5.

Participant 30. Figure L175 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 30.

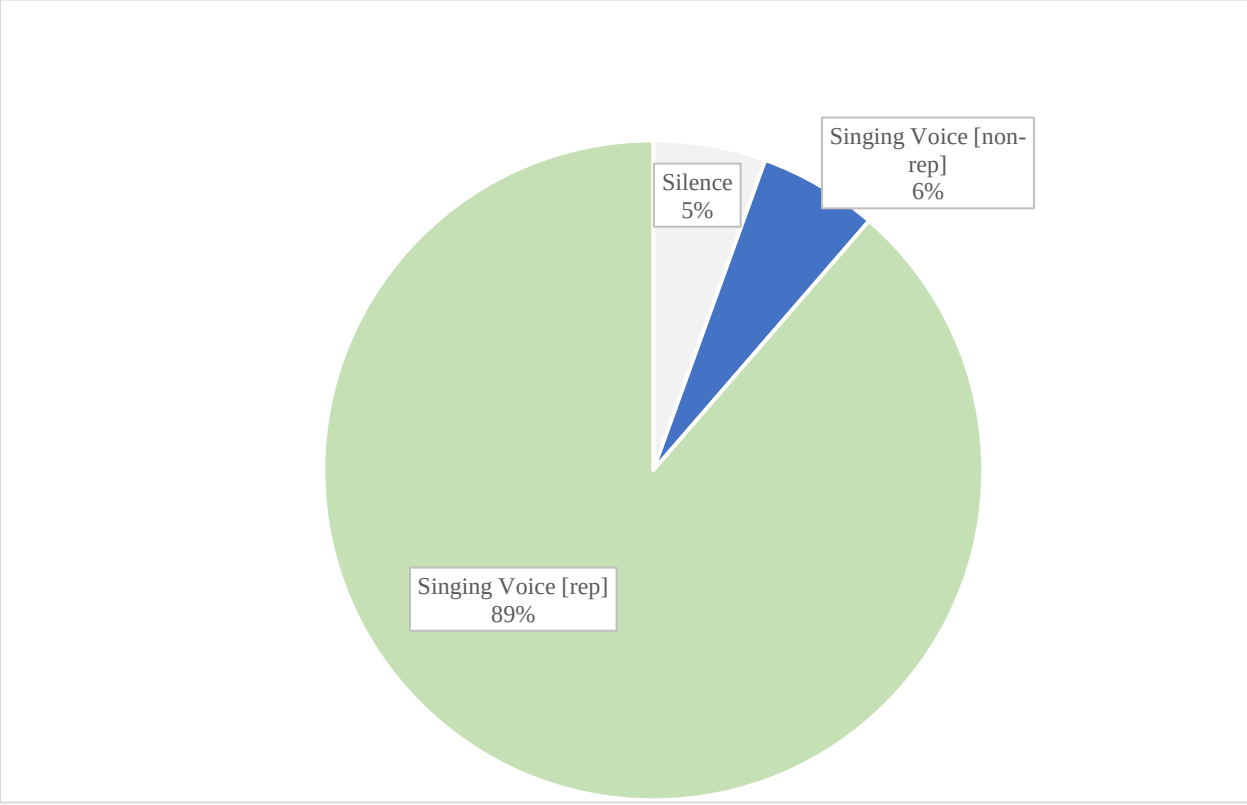

Figure L175. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 30.

Tables Figures L176 – L180 present the chronological order of observed behavioral categories for each individual session by Participant 30.

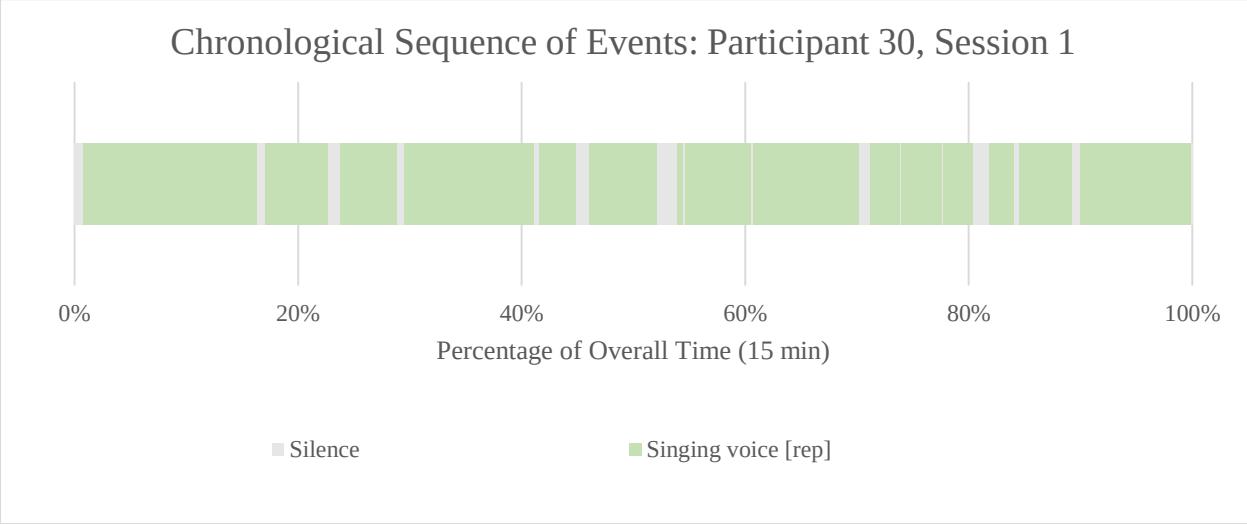

Figure L176. Chronological order of observed behavioral categories: Participant 30, Session 1.

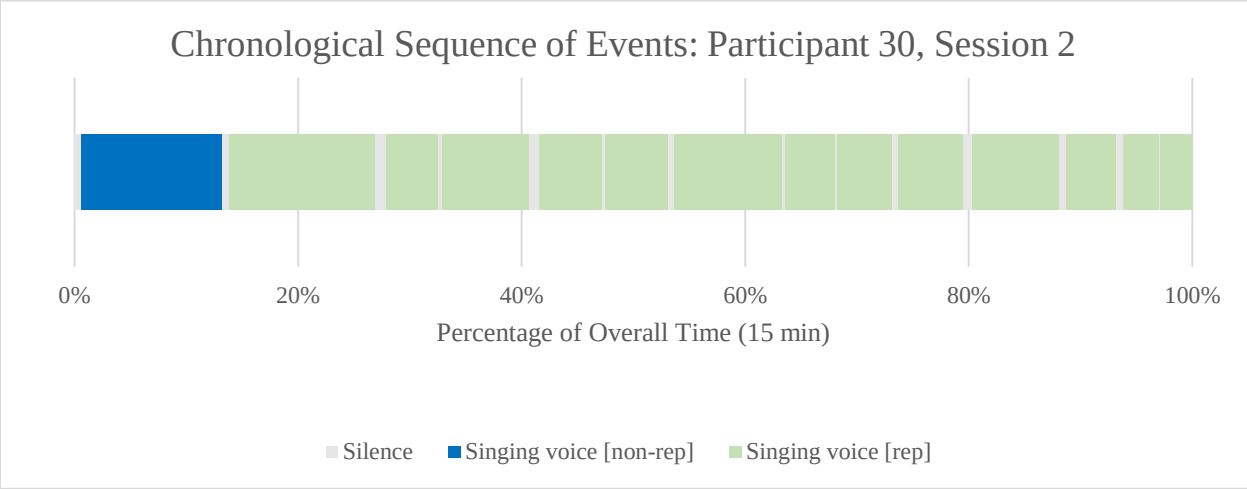

Figure L177. Chronological order of observed behavioral categories: Participant 30, Session 2.

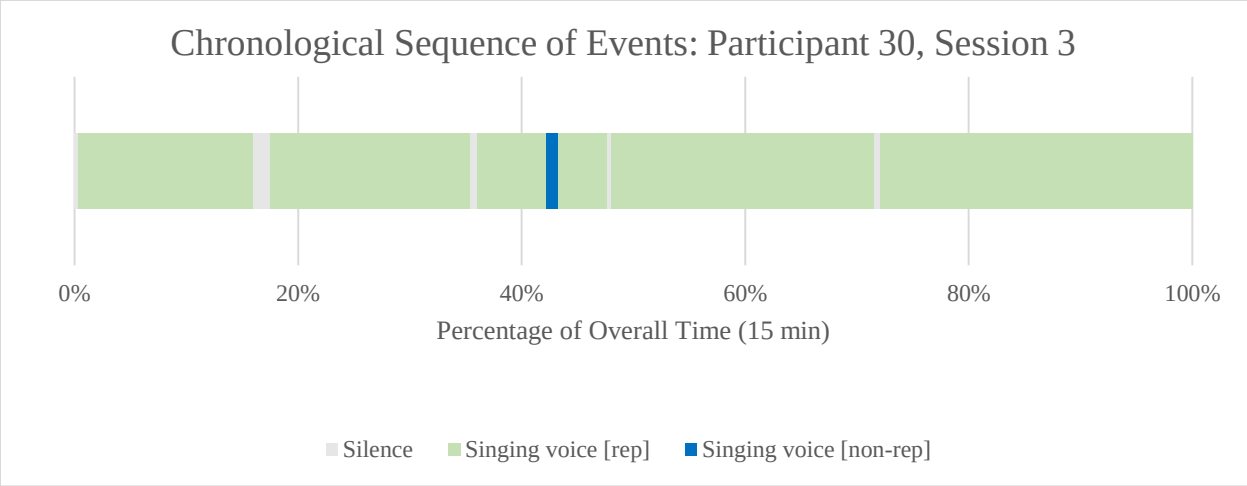

Figure L178. Chronological order of observed behavioral categories: Participant 30, Session 3.

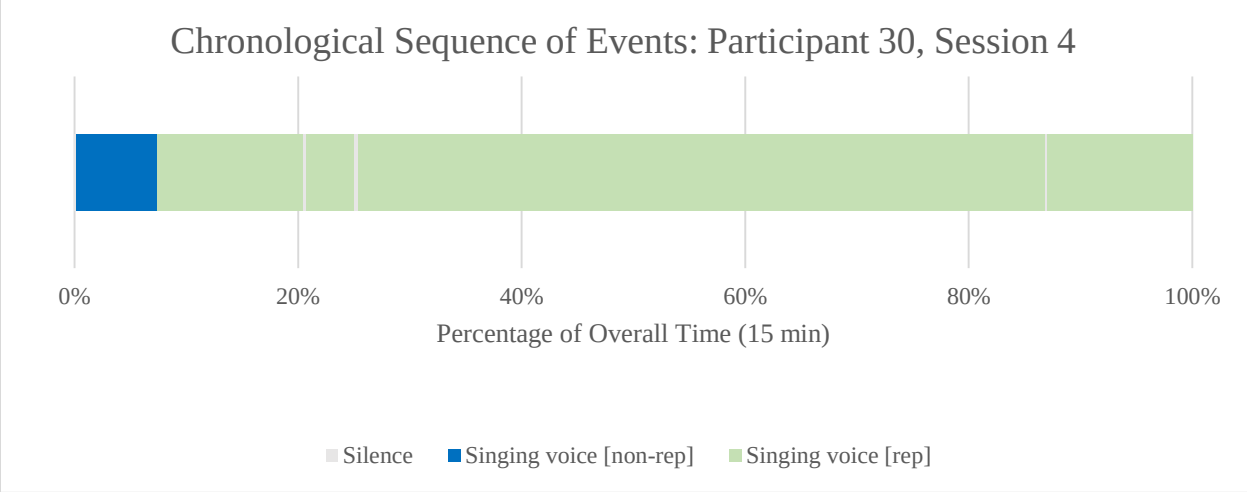

Figure L179. Chronological order of observed behavioral categories: Participant 30, Session 4.

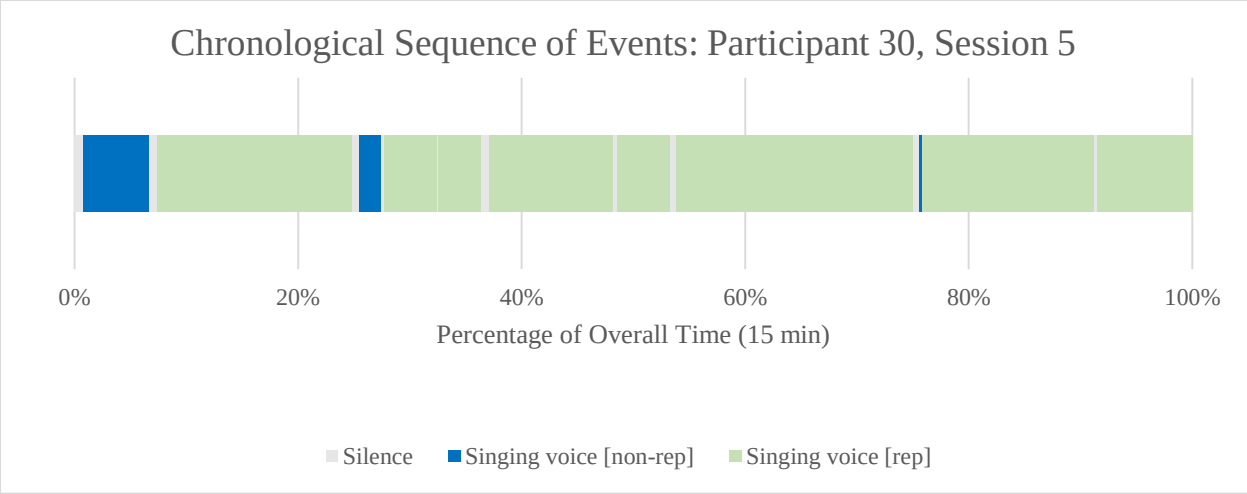

Figure L180. Chronological order of observed behavioral categories: Participant 30, Session 5.

Participant 31. Figure L181 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 31.

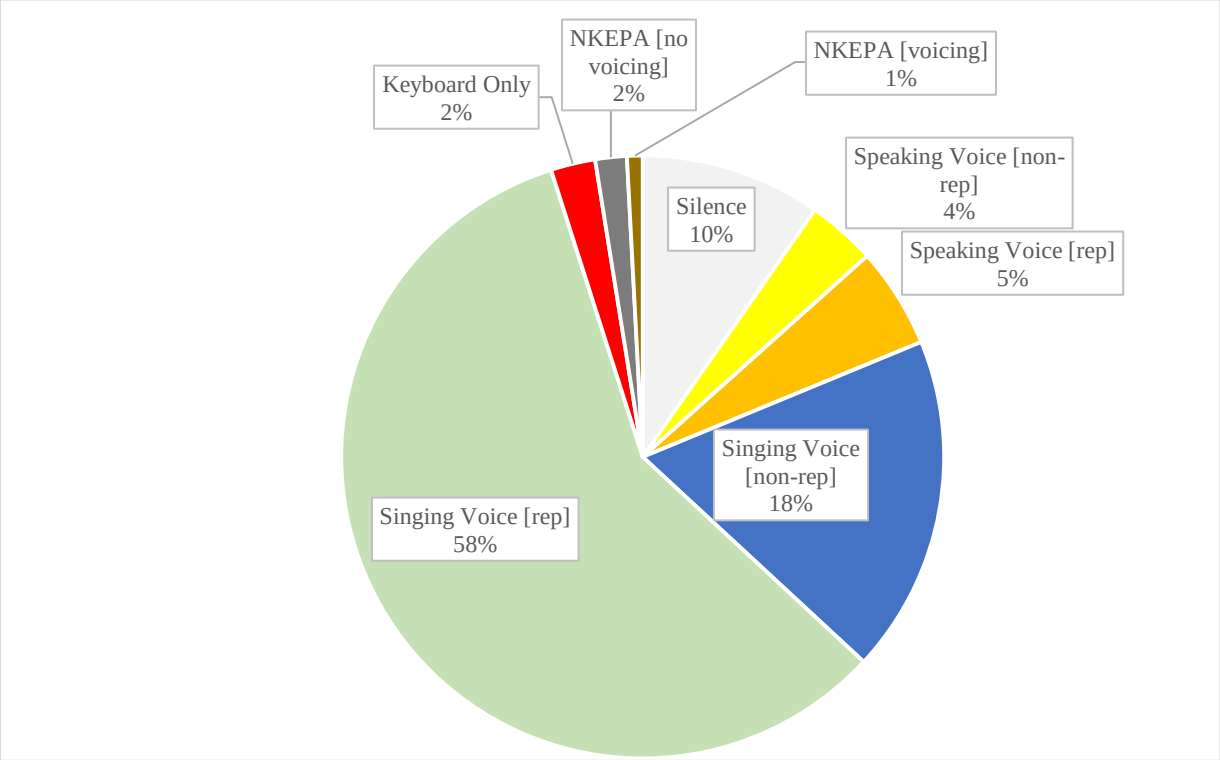

Figure L181. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 31.

Figures L182 – L186 present the chronological order of observed behavioral categories for each individual session by Participant 31.

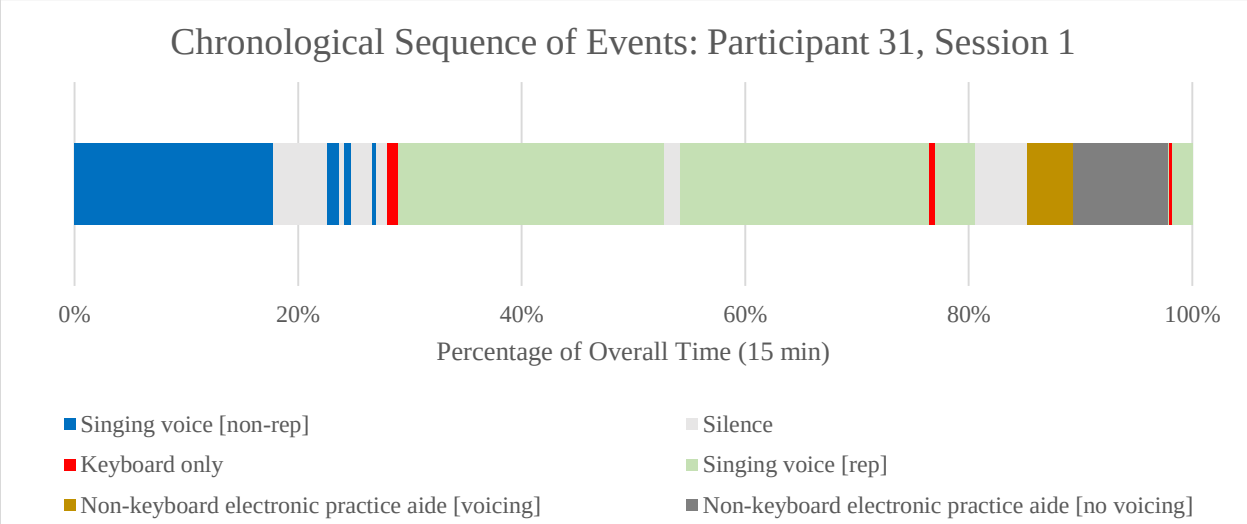

Figure L182. Chronological order of observed behavioral categories: Participant 31, Session 1.

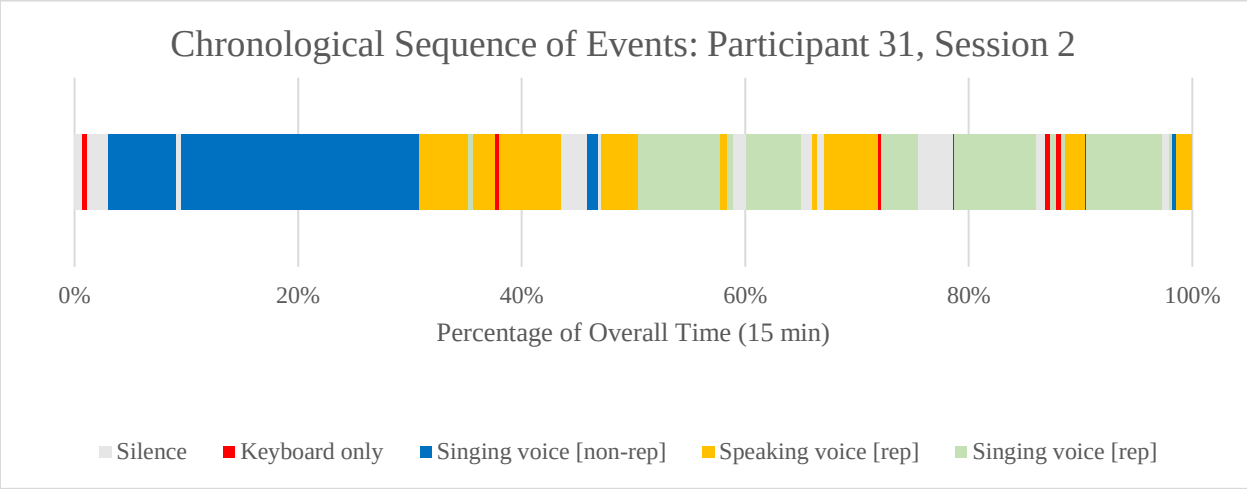

Figure L183. Chronological order of observed behavioral categories: Participant 31, Session 2.

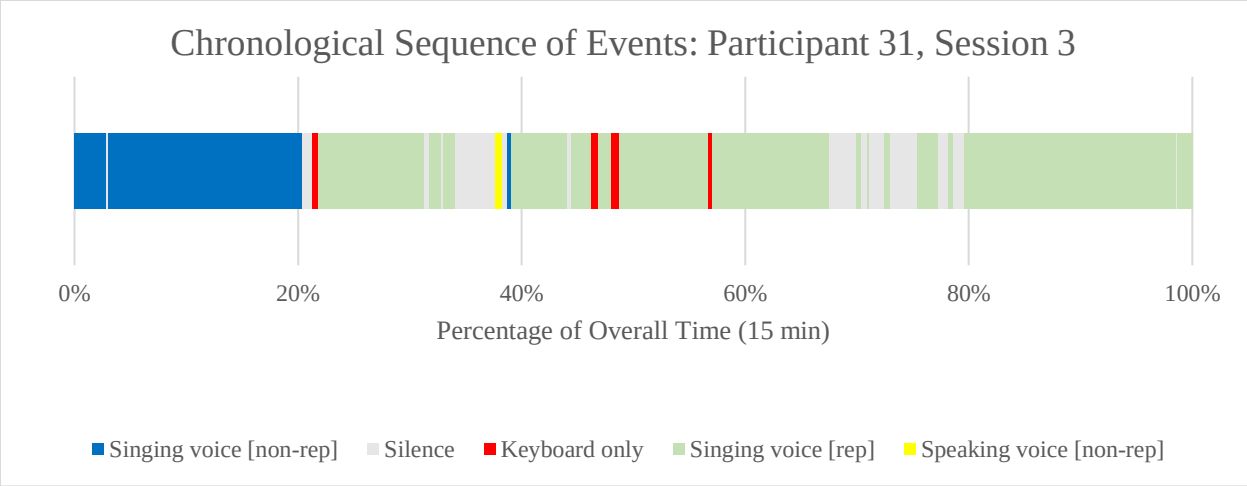

Figure L184. Chronological order of observed behavioral categories: Participant 31, Session 3.

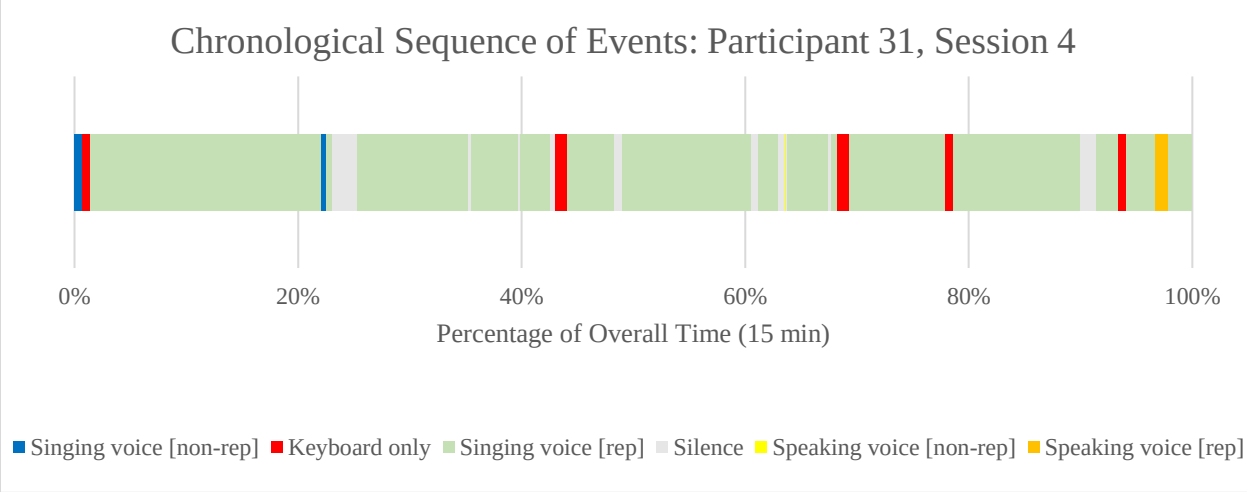

Figure L185. Chronological order of observed behavioral categories: Participant 31, Session 4.

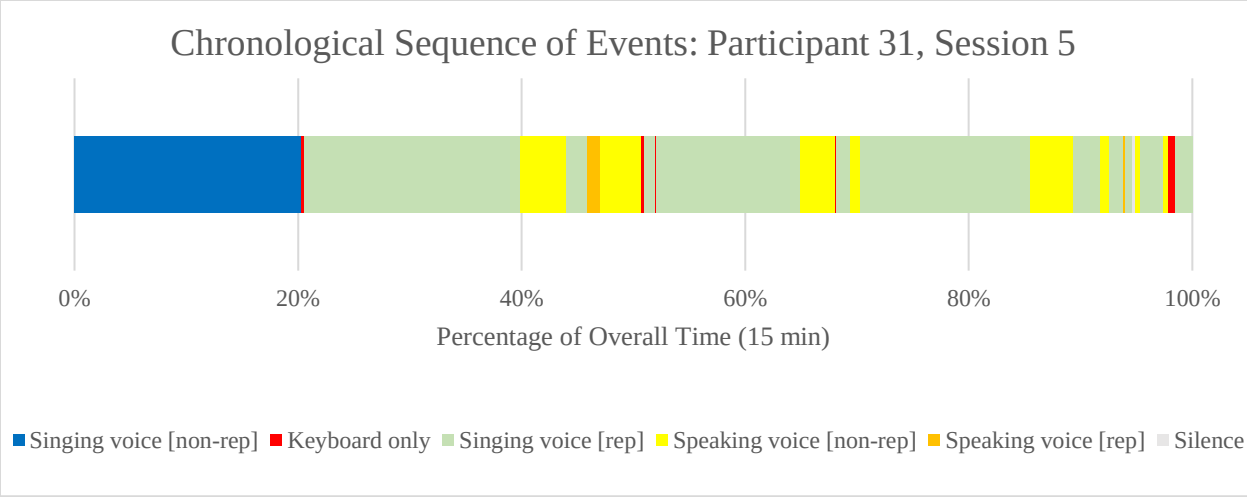

Figure L186. Chronological order of observed behavioral categories: Participant 31, Session 5.

Participant 32. Figure L187 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 32.

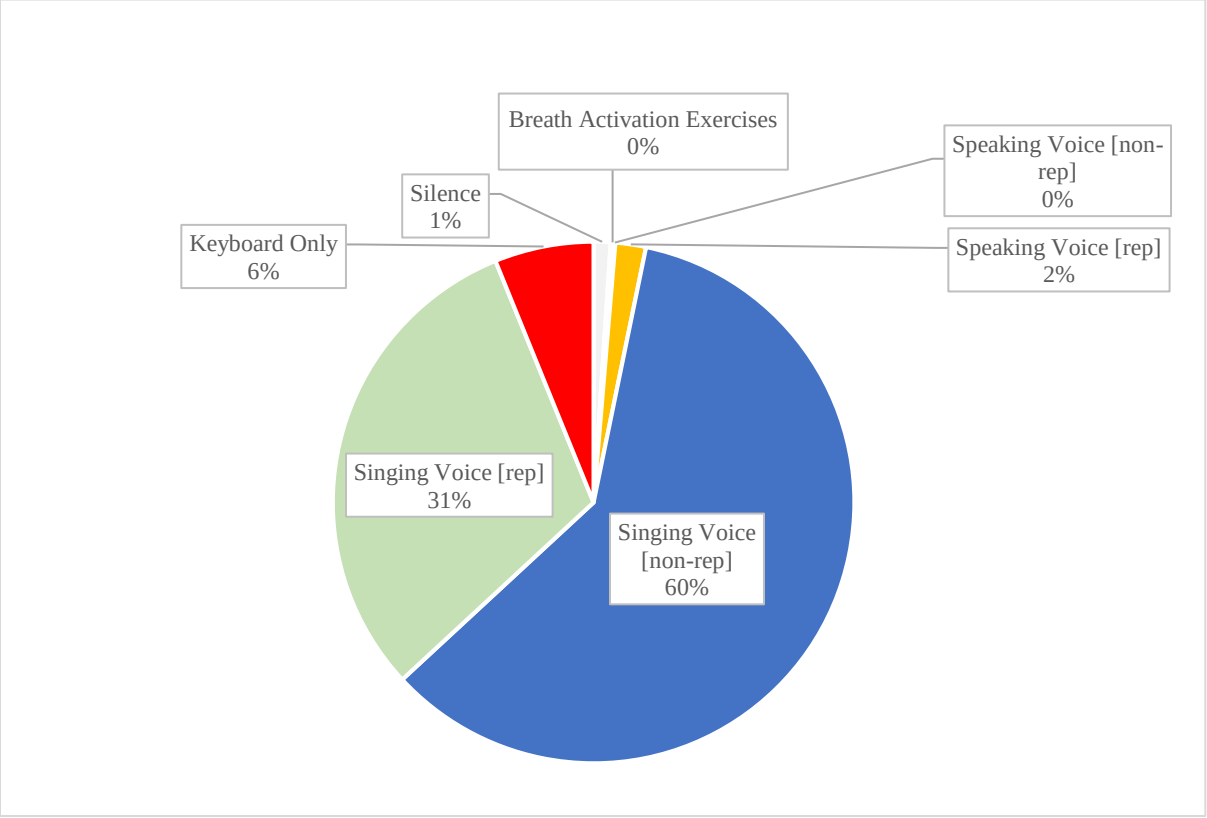

Figure L187. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 32.

Figures L188 – L192 present the chronological order of observed behavioral categories for each individual session by Participant 32.

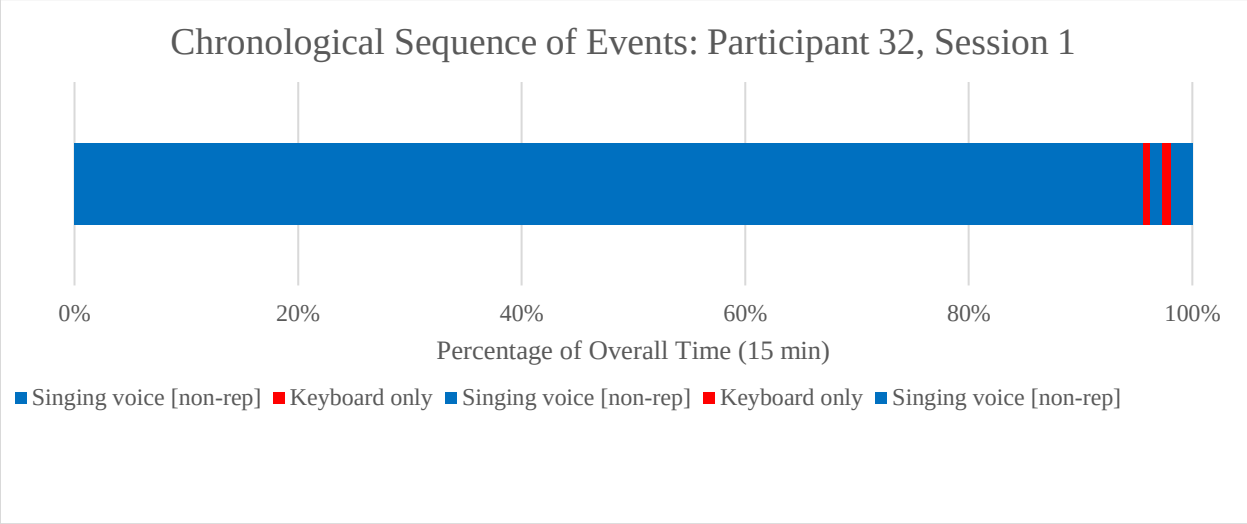

Figure L188. Chronological order of observed behavioral categories: Participant 32, Session 1.

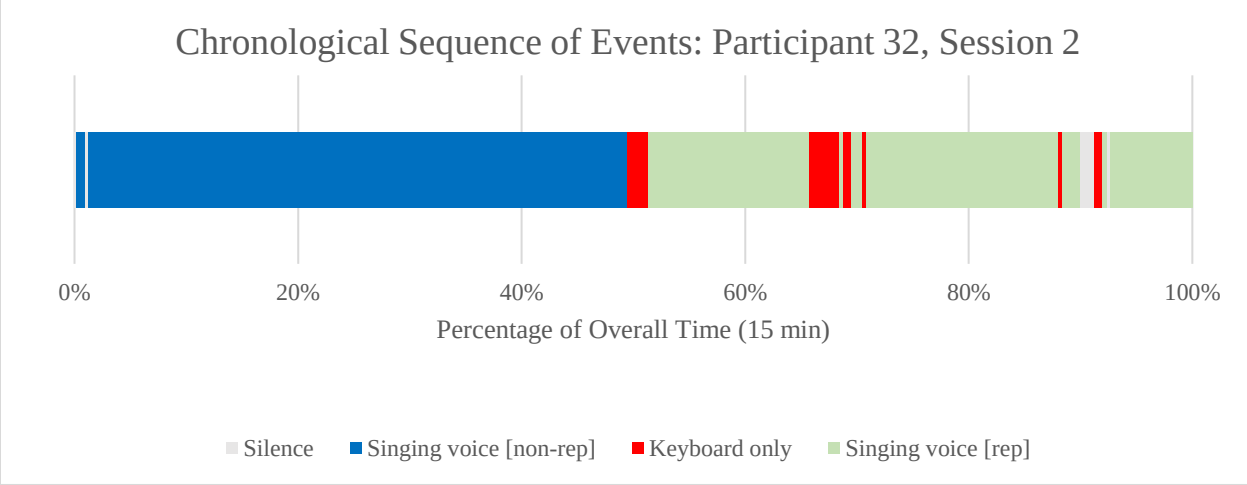

Figure L189. Chronological order of observed behavioral categories: Participant 32, Session 2.

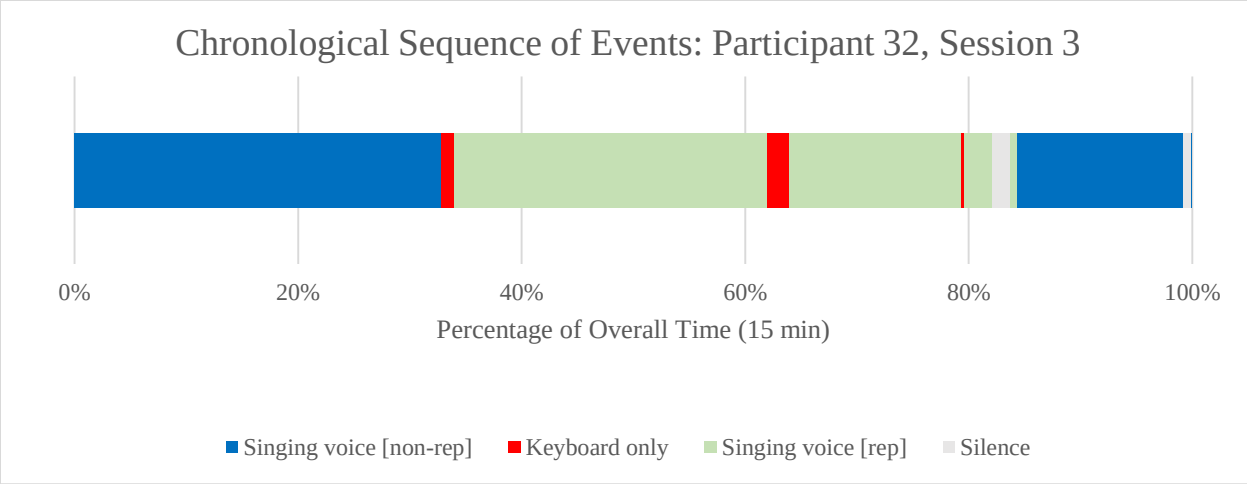

Figure L190. Chronological order of observed behavioral categories: Participant 32, Session 3.

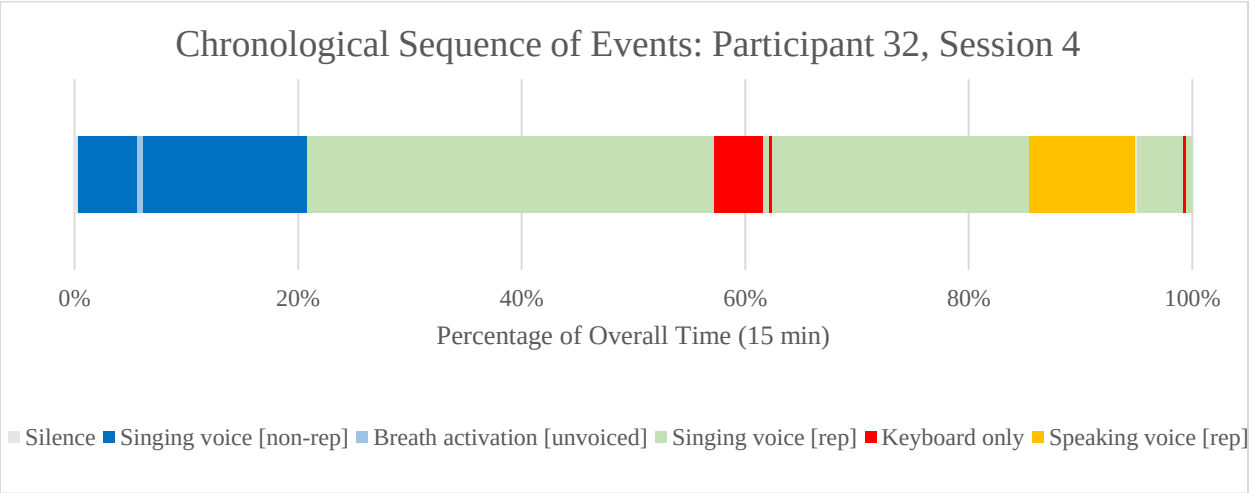

Figure L191. Chronological order of observed behavioral categories: Participant 32, Session 4.

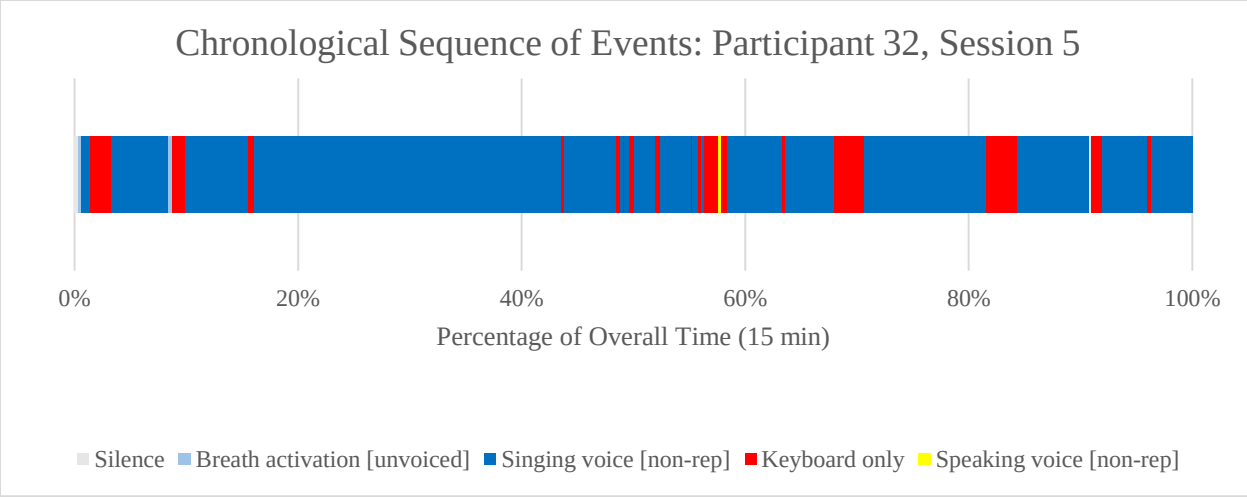

Figure L192. Chronological order of observed behavioral categories: Participant 32, Session 5.

Participant 33. Figure L193 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 33.

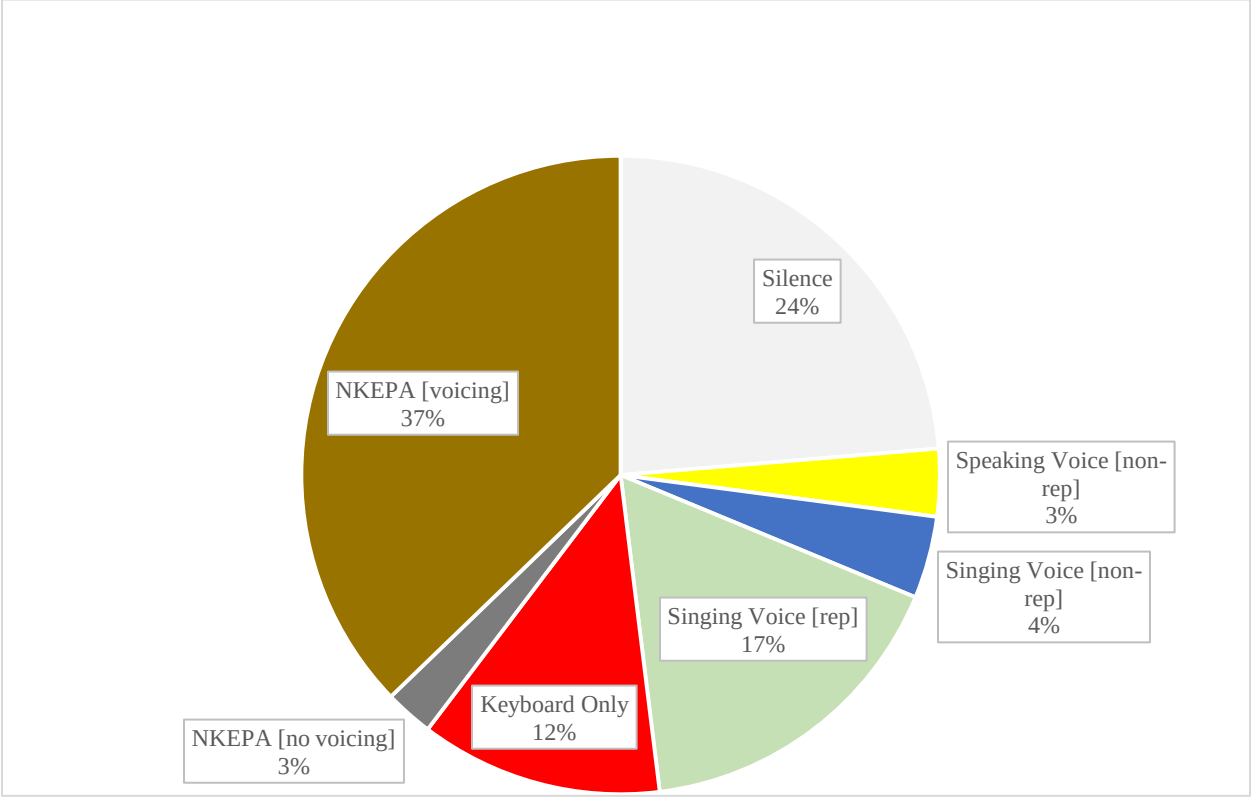

Figure L193. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 33.

Figures L194 – L198 present the chronological order of observed behavioral categories for each individual session by Participant 33.

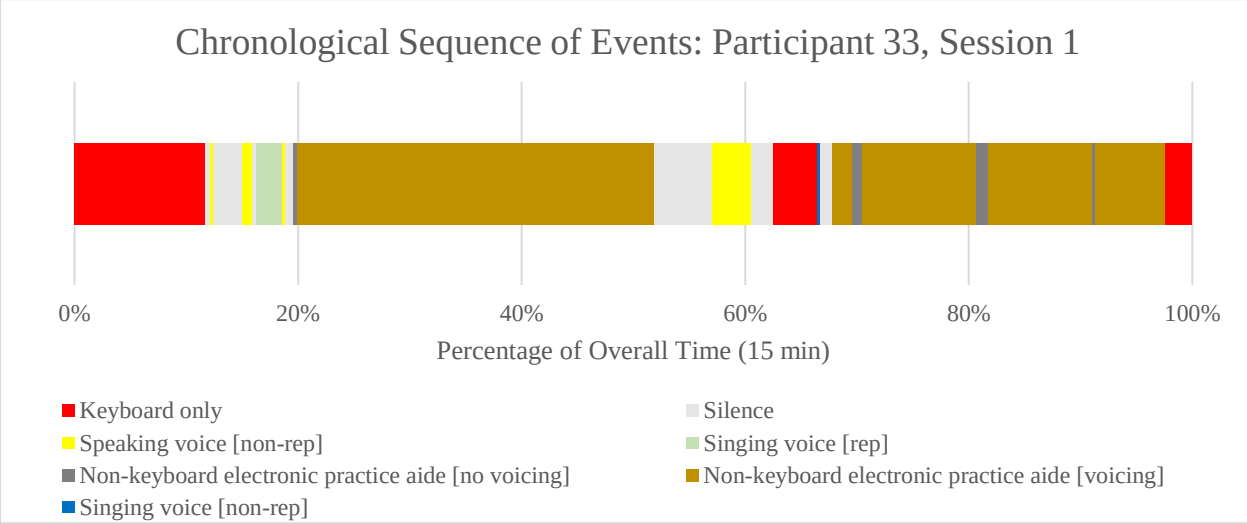

Figure L194. Chronological order of observed behavioral categories: Participant 33, Session 1.

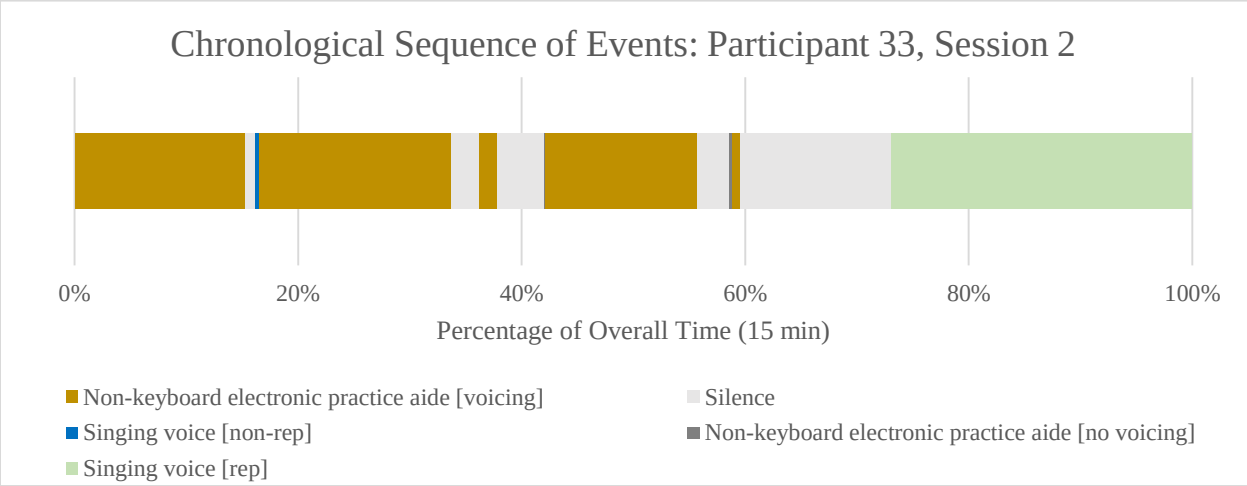

Figure L195. Chronological order of observed behavioral categories: Participant 33, Session 2.

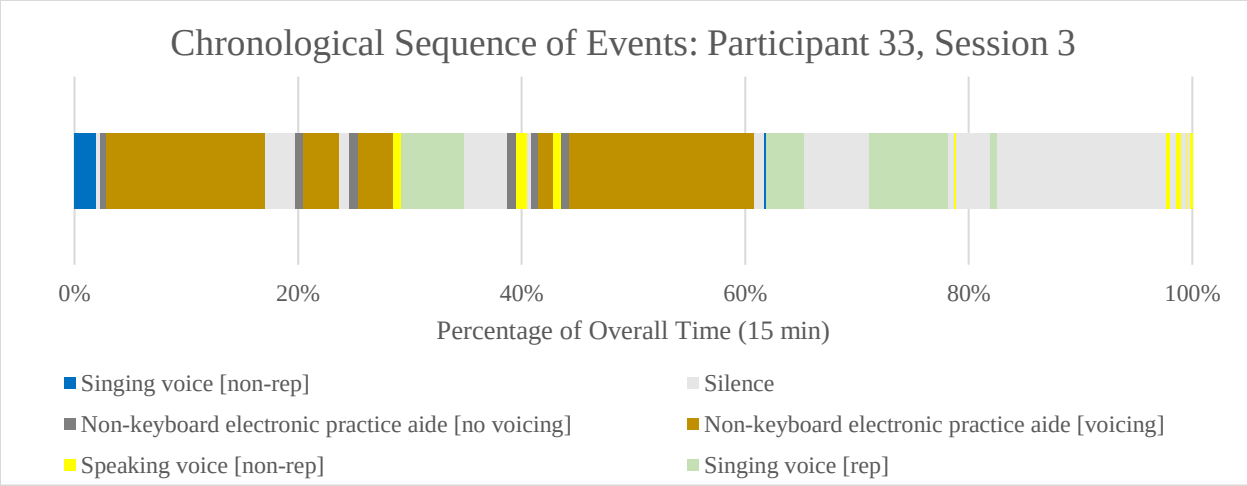

Figure L196. Chronological order of observed behavioral categories: Participant 33, Session 3.

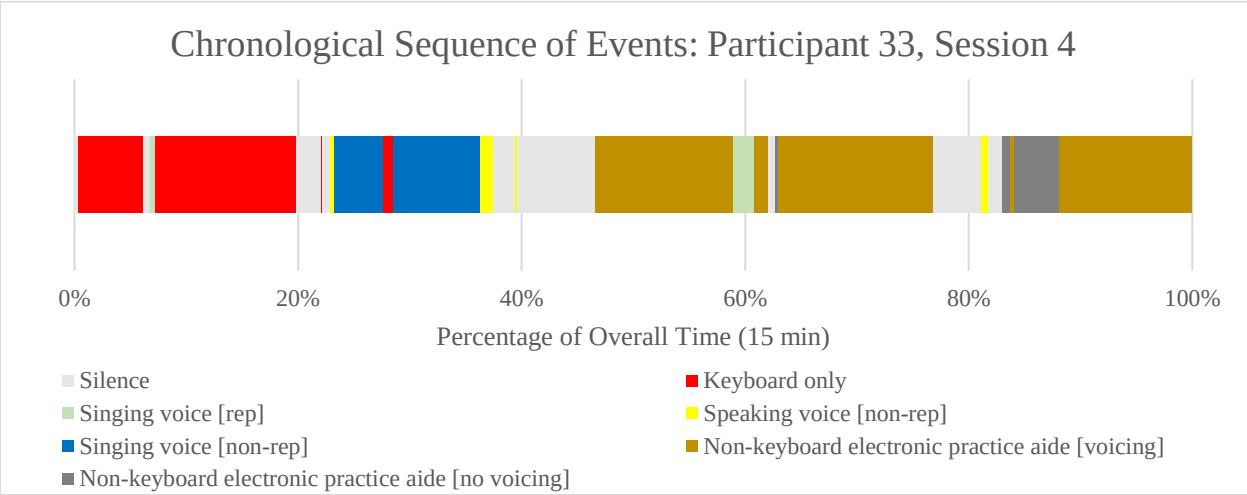

Figure L197. Chronological order of observed behavioral categories: Participant 33, Session 4.

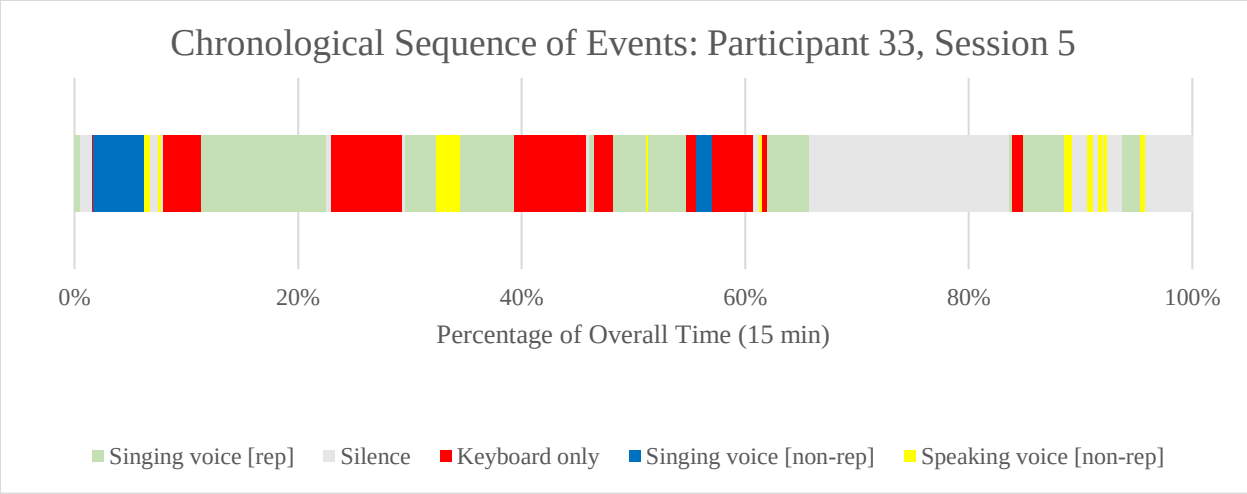

Figure L198. Chronological order of observed behavioral categories: Participant 33, Session 5.

Participant 34. Figure L199 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 34.

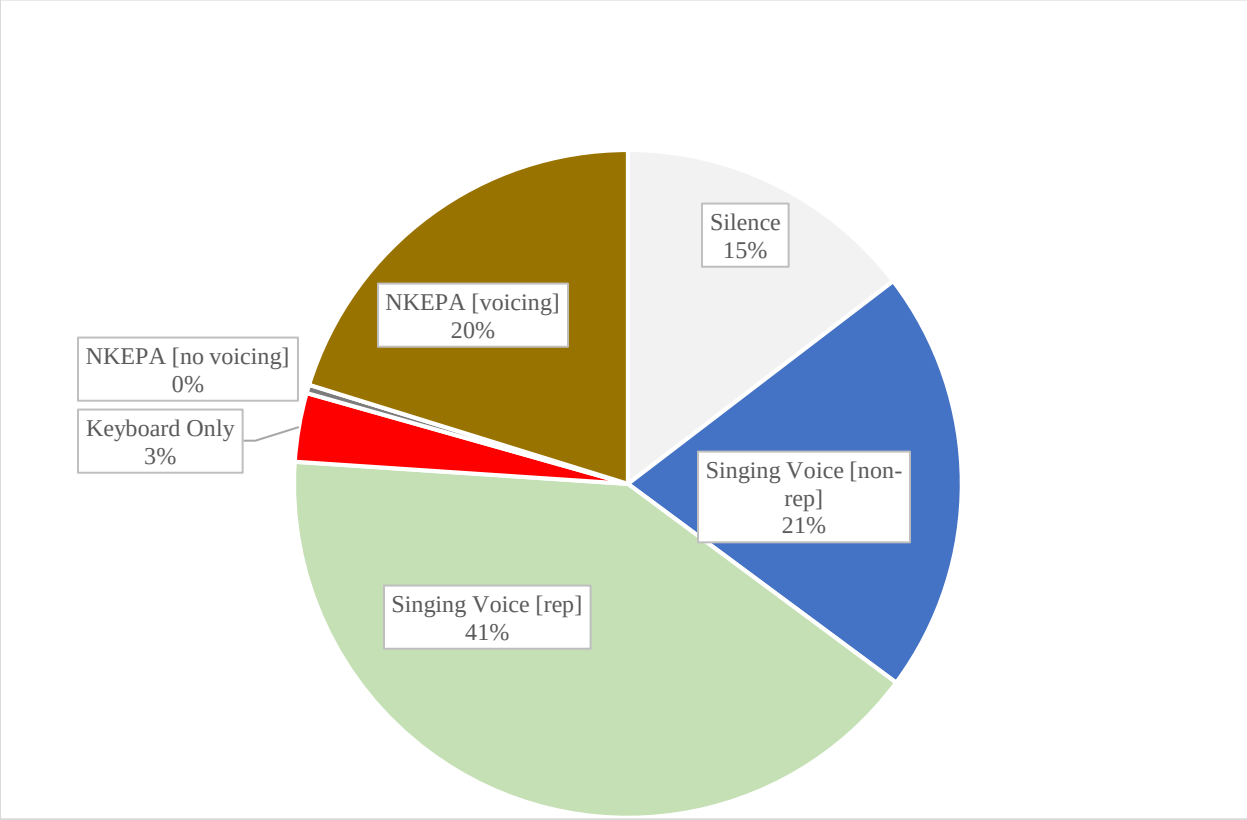

Figure L199. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 34.

Figures L200 – L204 present the chronological order of observed behavioral categories for each individual session by Participant 34.

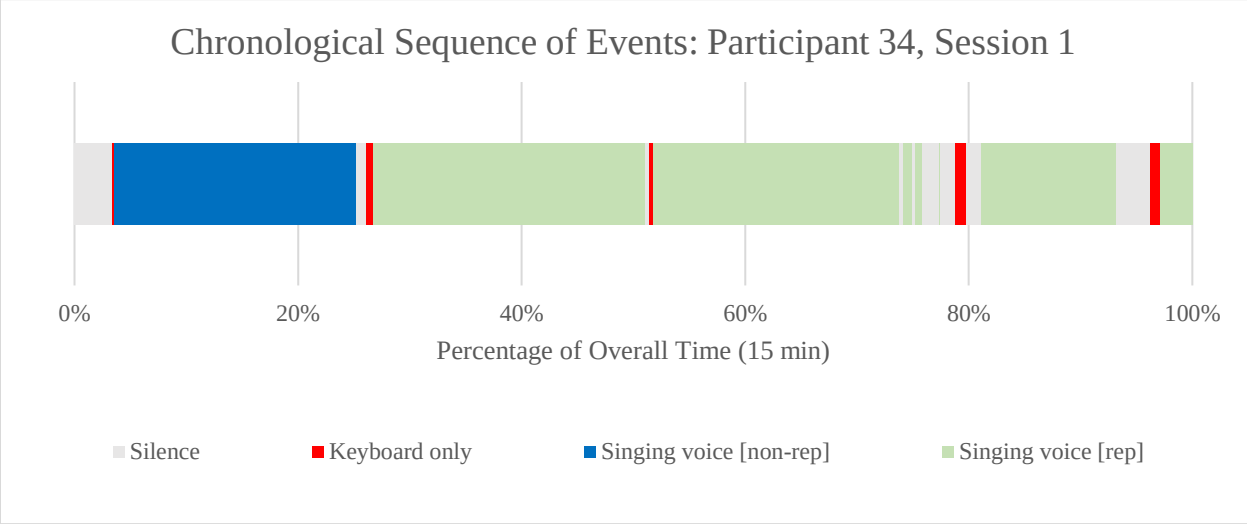

Figure L200. Chronological order of observed behavioral categories: Participant 34, Session 1.

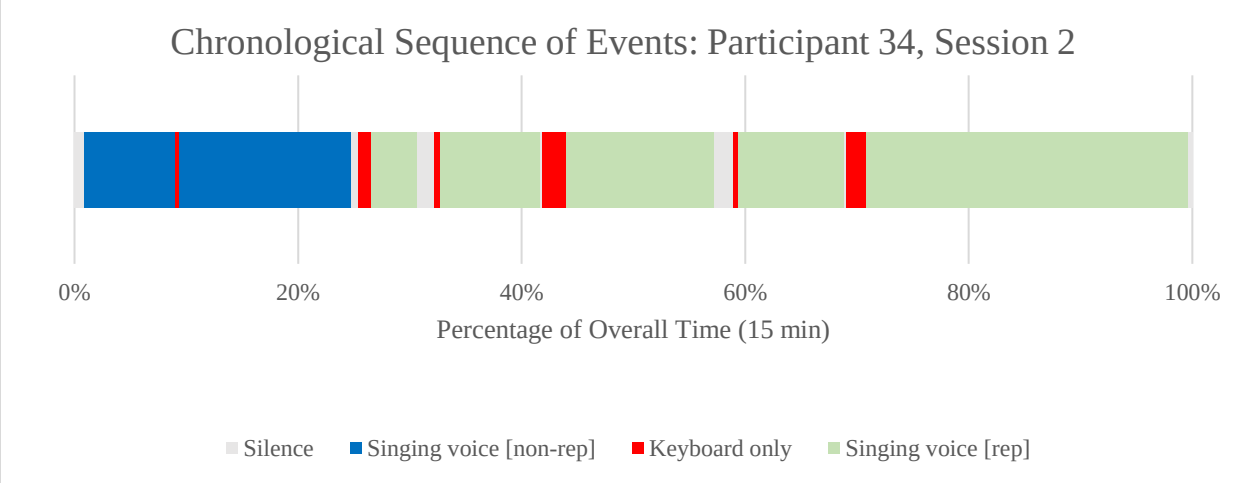

Figure L201. Chronological order of observed behavioral categories: Participant 34, Session 2.

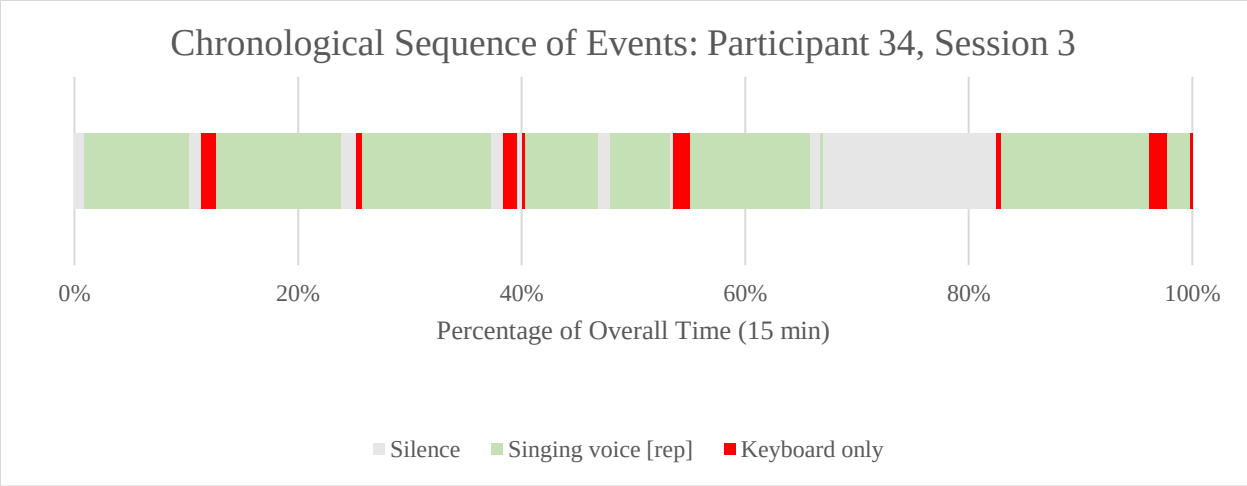

Figure L202. Chronological order of observed behavioral categories: Participant 34, Session 3.

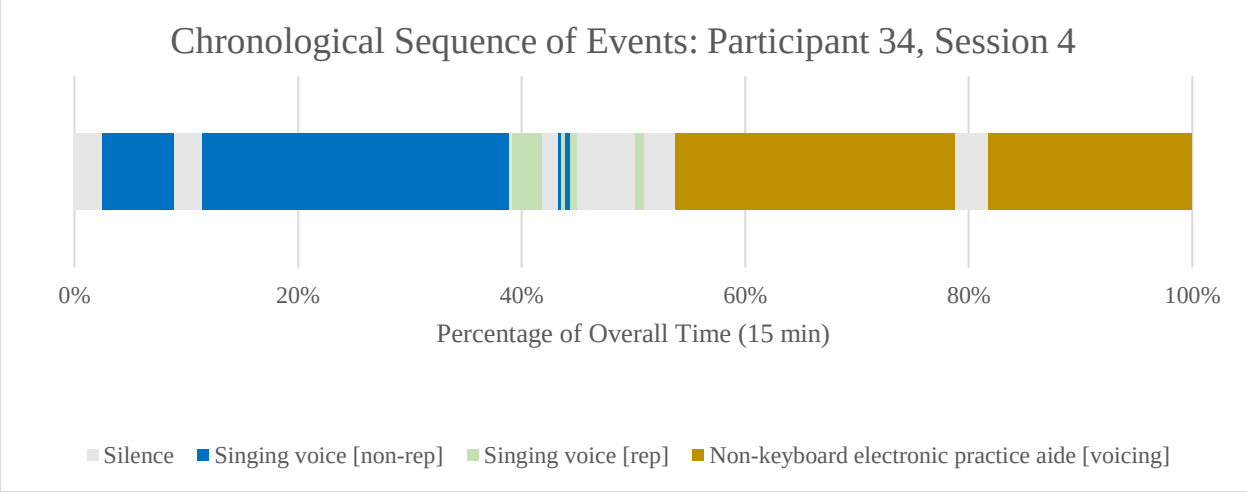

Figure L203. Chronological order of observed behavioral categories: Participant 34, Session 4.

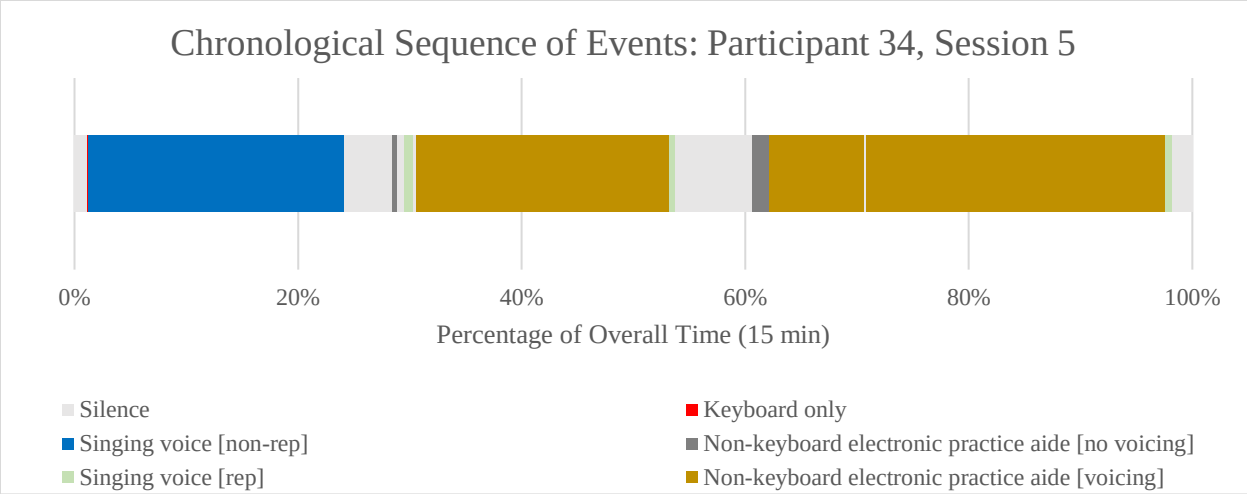

Figure L204. Chronological order of observed behavioral categories: Participant 34, Session 5.

Participant 35. Figure L205 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 35.

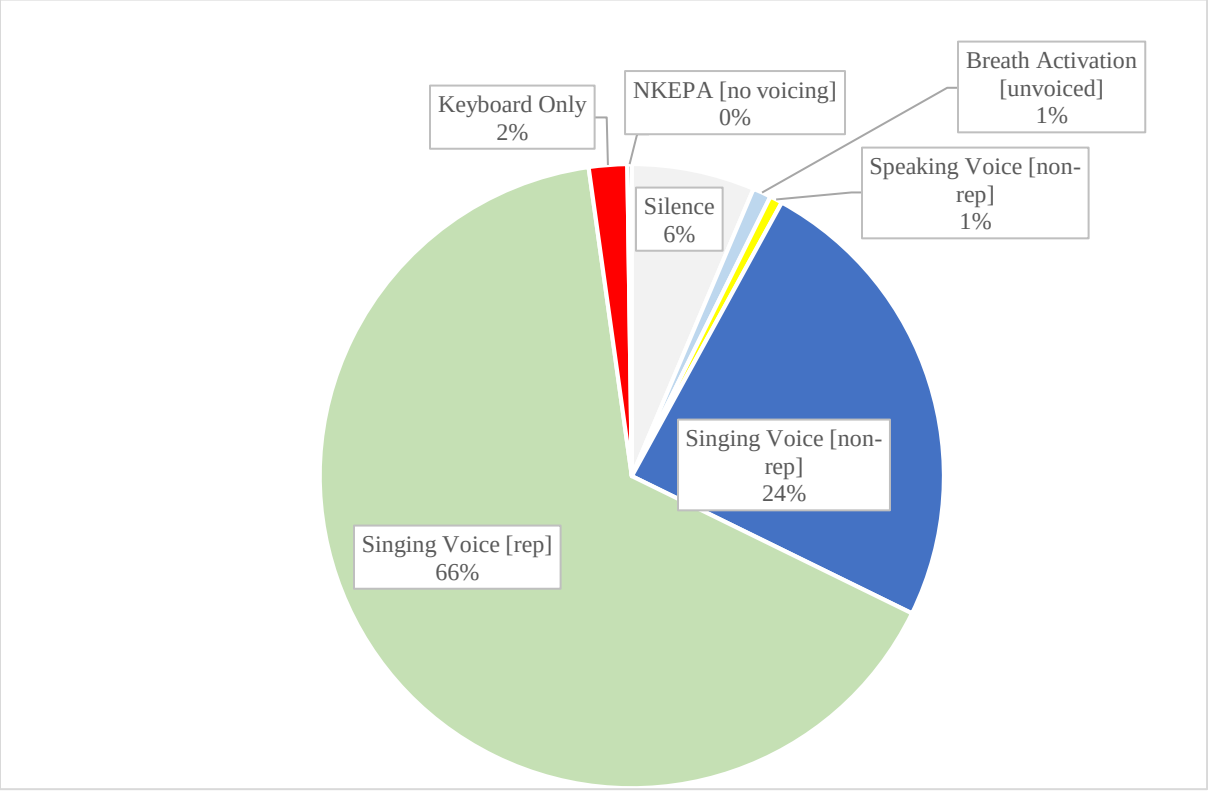

Figure L205. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 35.

Figures L206 – L210 present the chronological order of observed behavioral categories for each individual session by Participant 35.

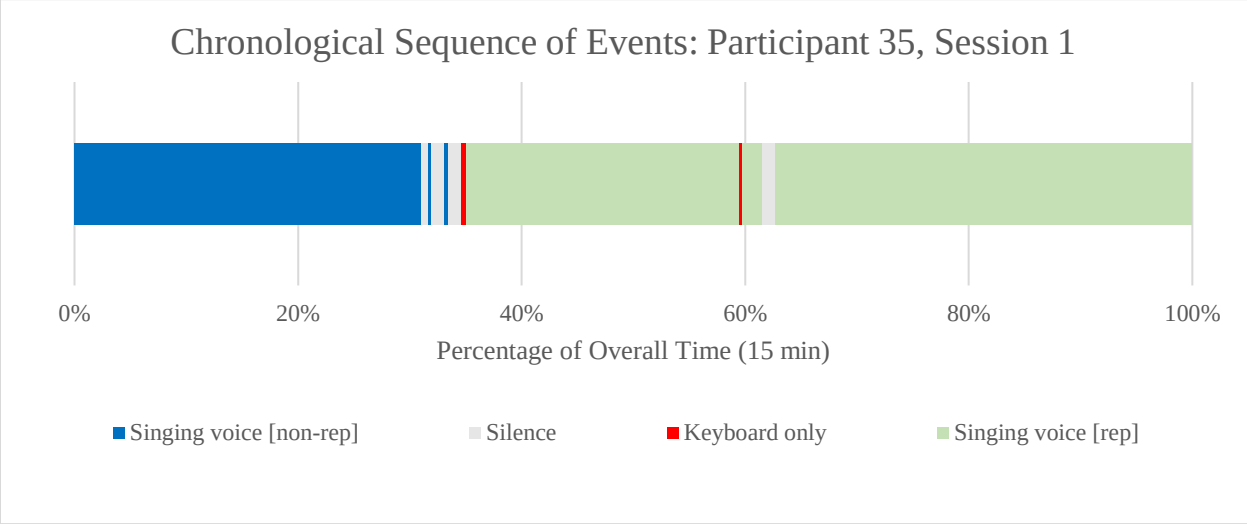

Figure L206. Chronological order of observed behavioral categories: Participant 35, Session 1.

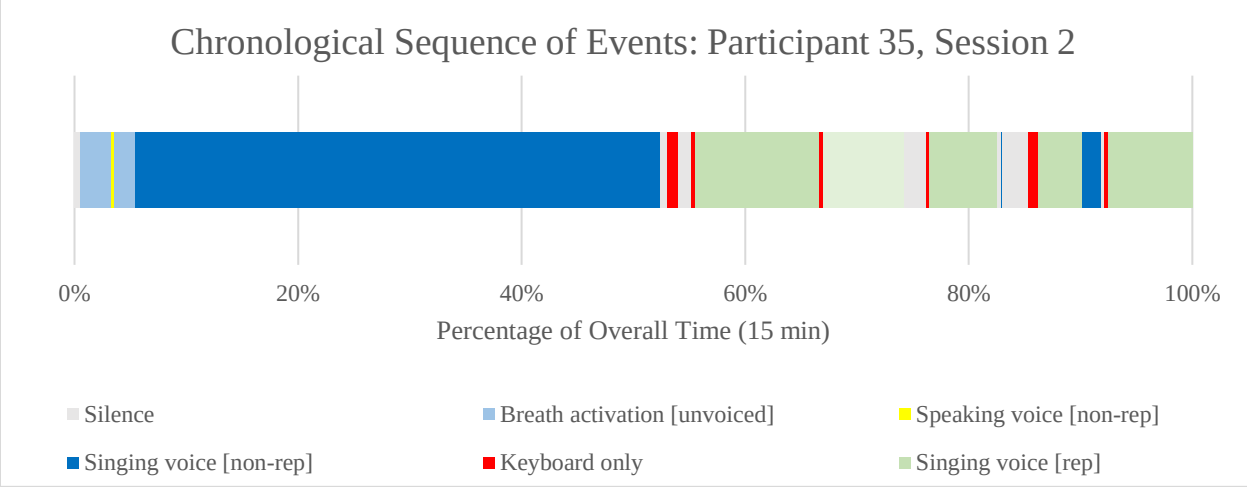

Figure L207. Chronological order of observed behavioral categories: Participant 35, Session 2.

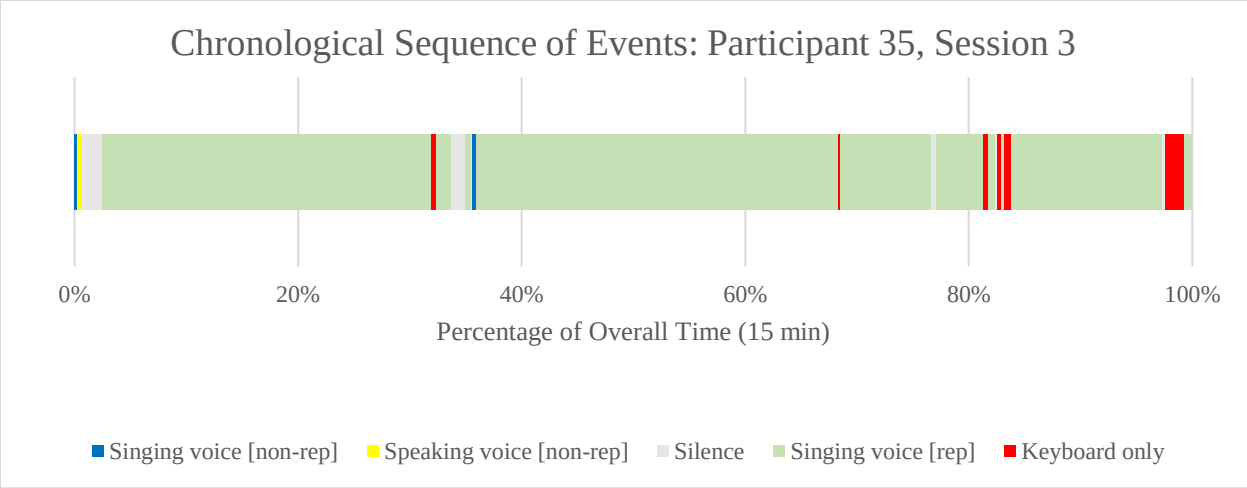

Figure L208. Chronological order of observed behavioral categories: Participant 35, Session 3.

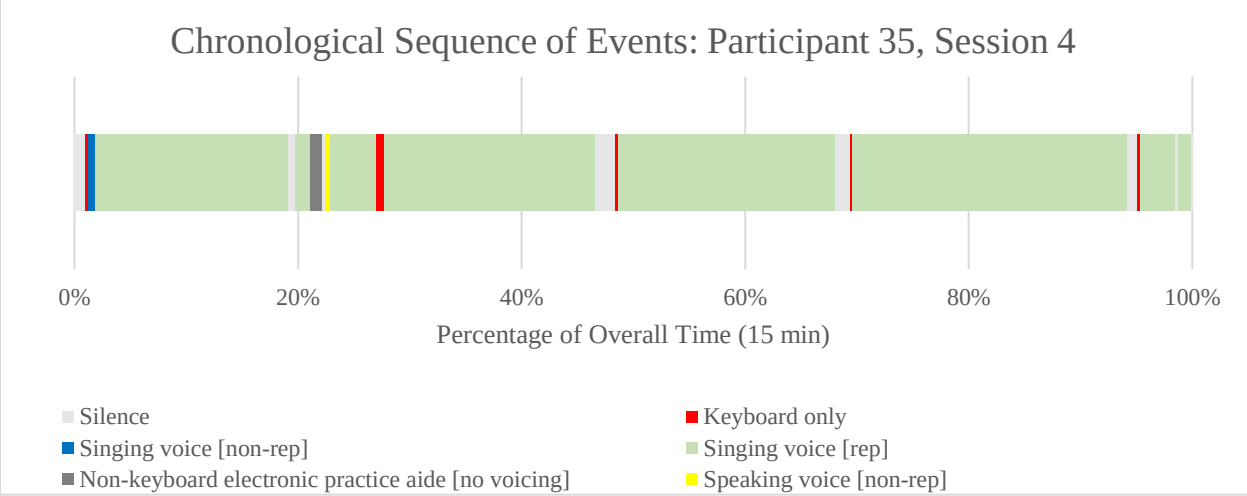

Figure L209. Chronological order of observed behavioral categories: Participant 35, Session 4.

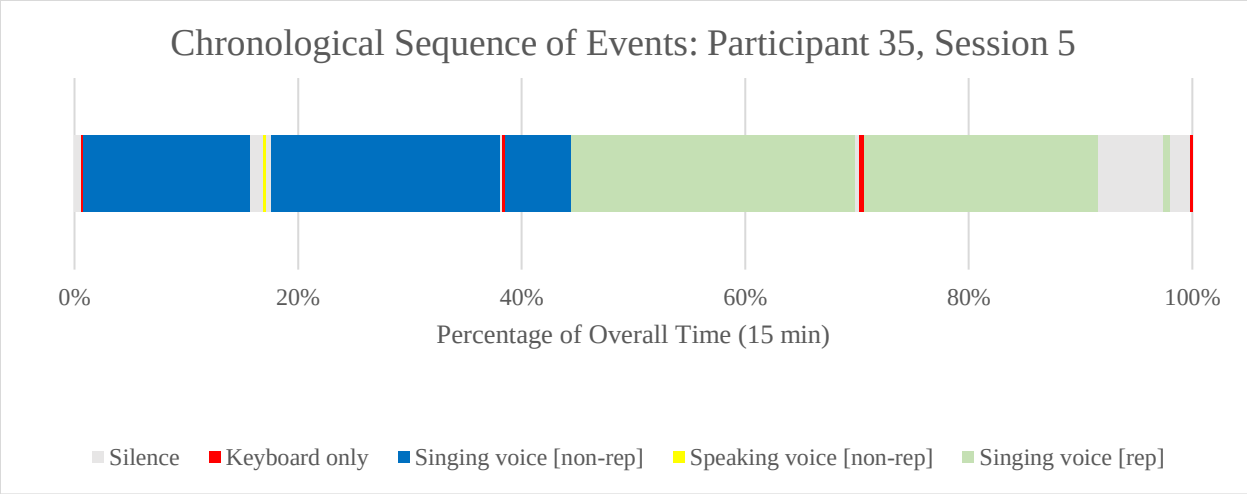

Figure L210. Chronological order of observed behavioral categories: Participant 35, Session 5.

Participant 36. Figure L211 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 36.

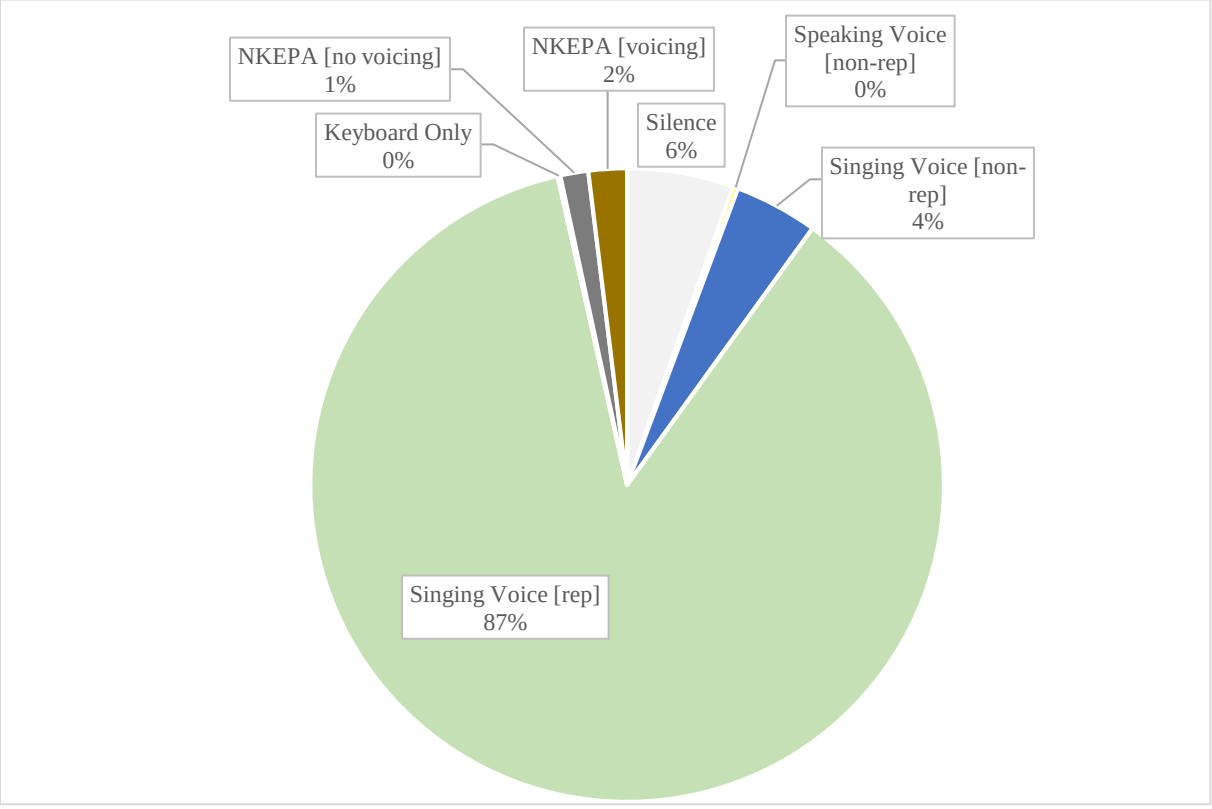

Figure L211. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 36.

Figures L212 – L216 resent the chronological order of observed behavioral categories for each individual session by Participant 36.

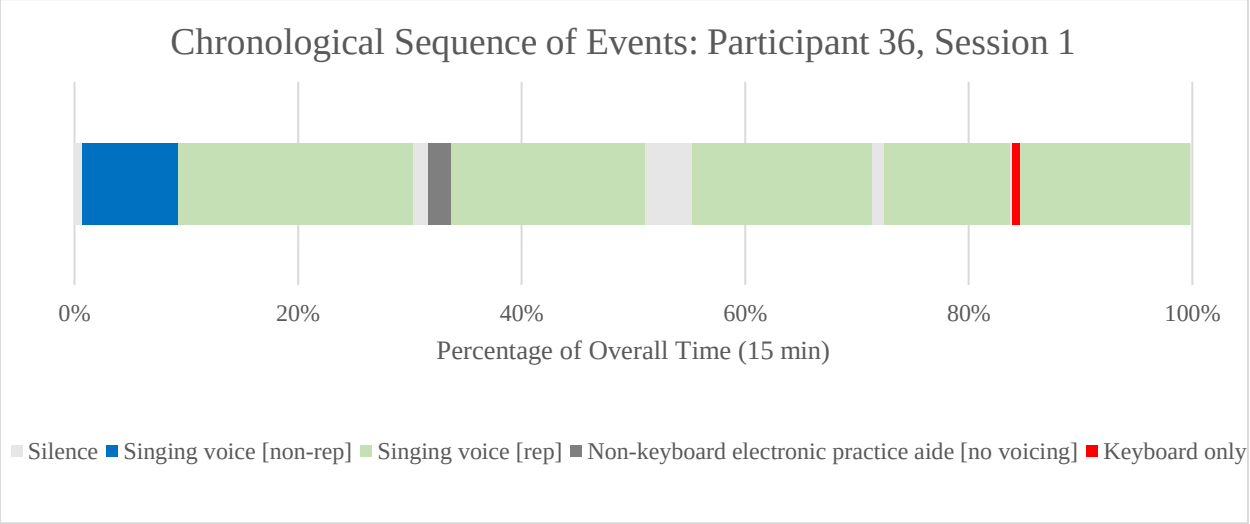

Figure L212. Chronological order of observed behavioral categories: Participant 36, Session 1.

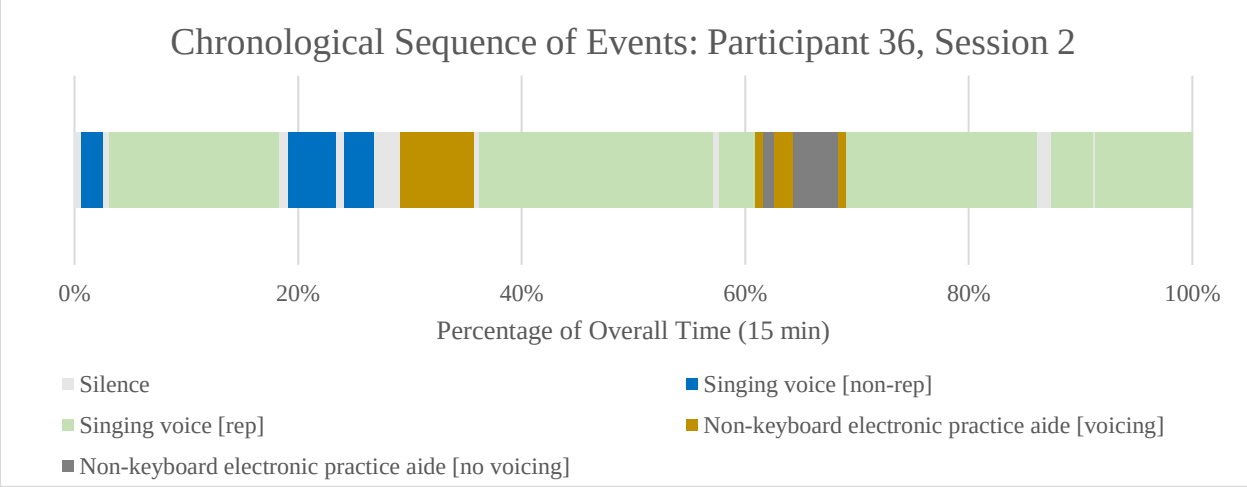

Figure L213. Chronological order of observed behavioral categories: Participant 36, Session 2.

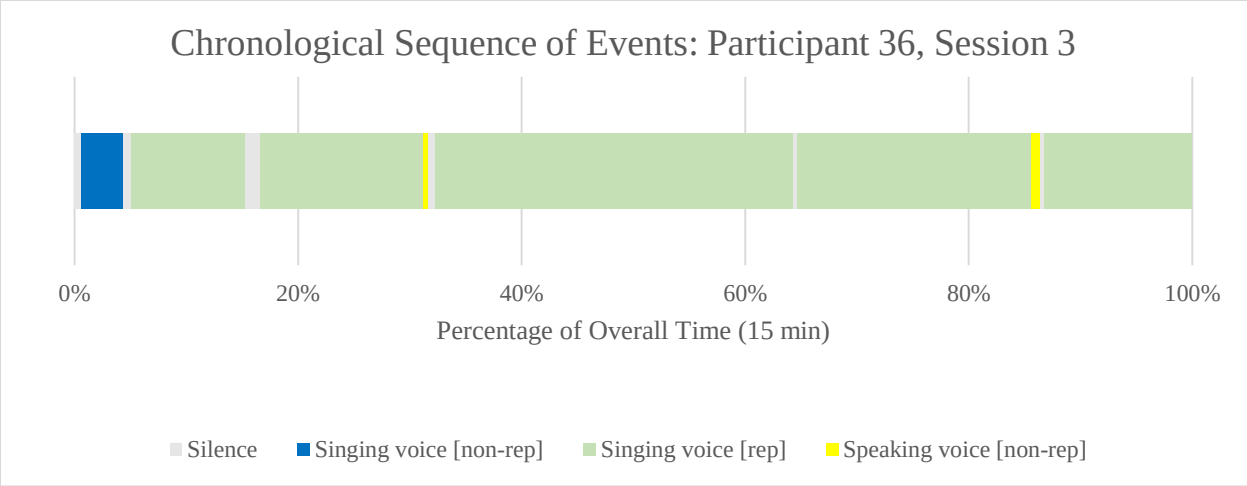

Figure L214. Chronological order of observed behavioral categories: Participant 36, Session 3.

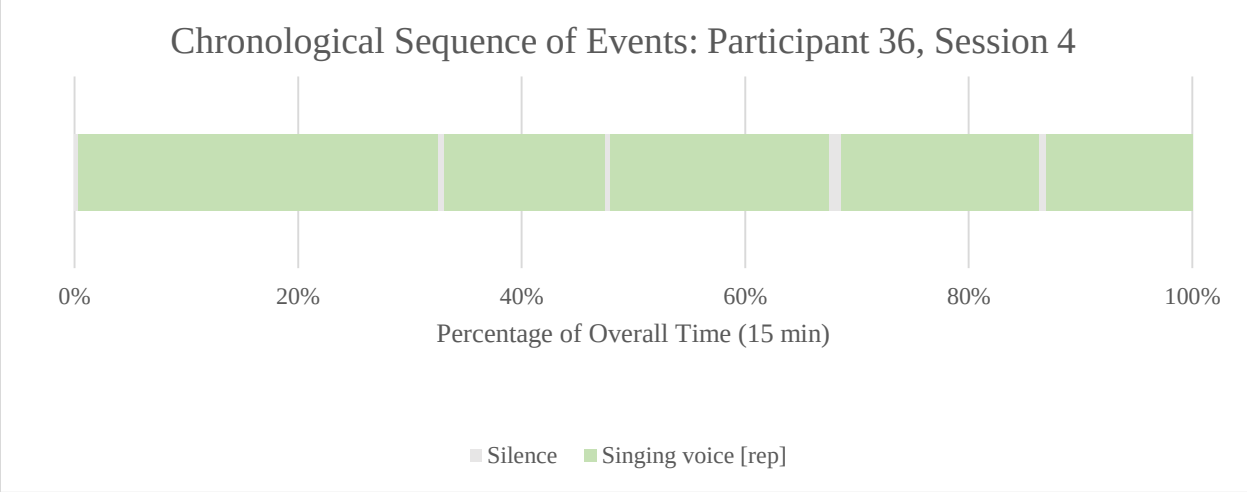

Figure L215. Chronological order of observed behavioral categories: Participant 36, Session 4.

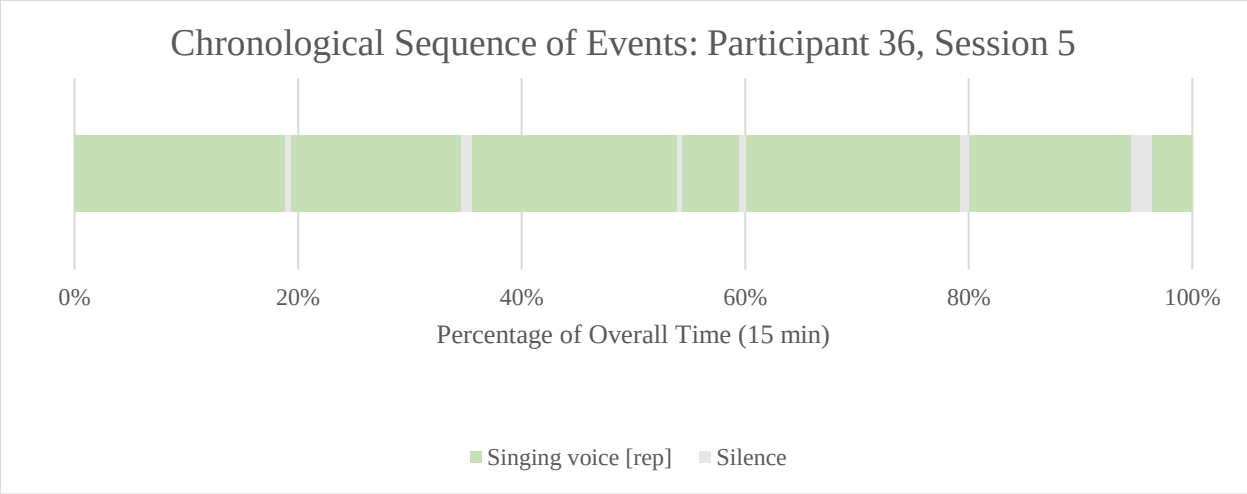

Figure L216. Chronological order of observed behavioral categories: Participant 36, Session 5.

Participant 37. Figure L217 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 37.

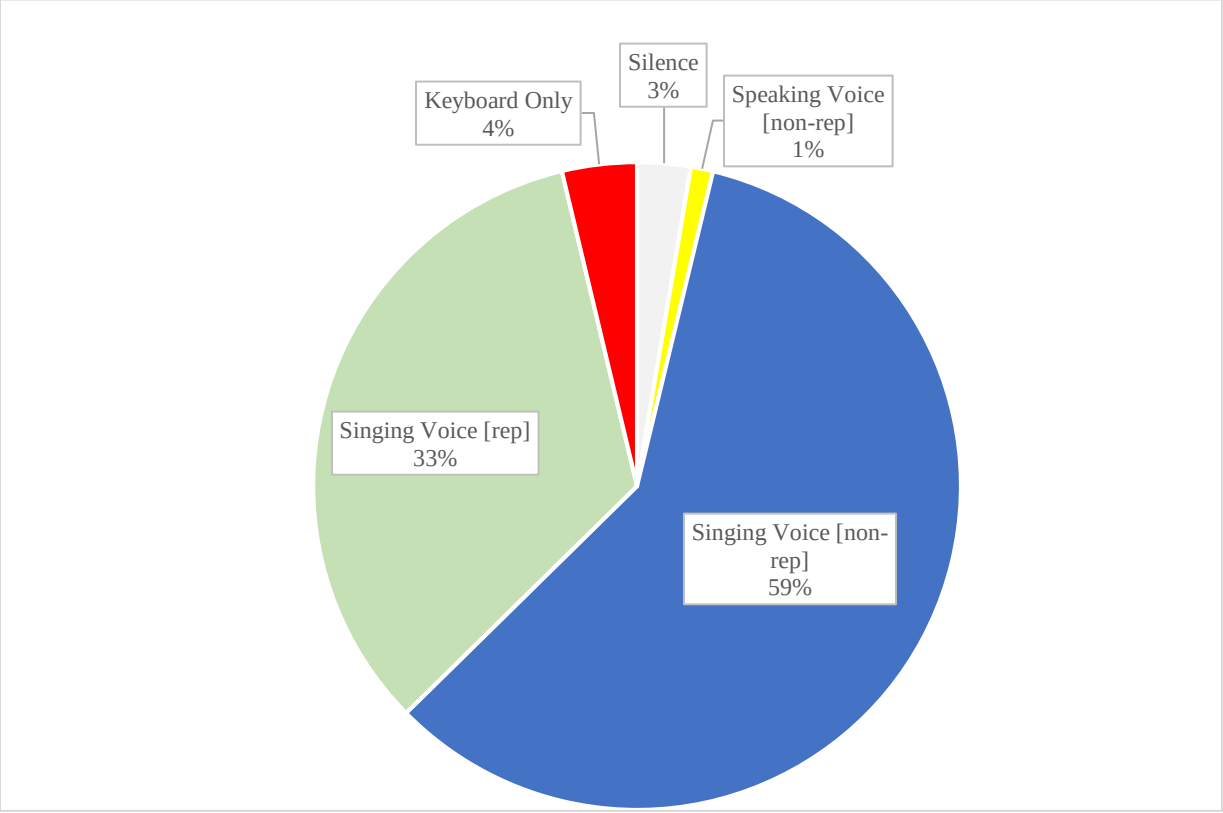

Figure L217. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 37.

Figures L218 – L222 present the chronological order of observed behavioral categories for each individual session by Participant 37.

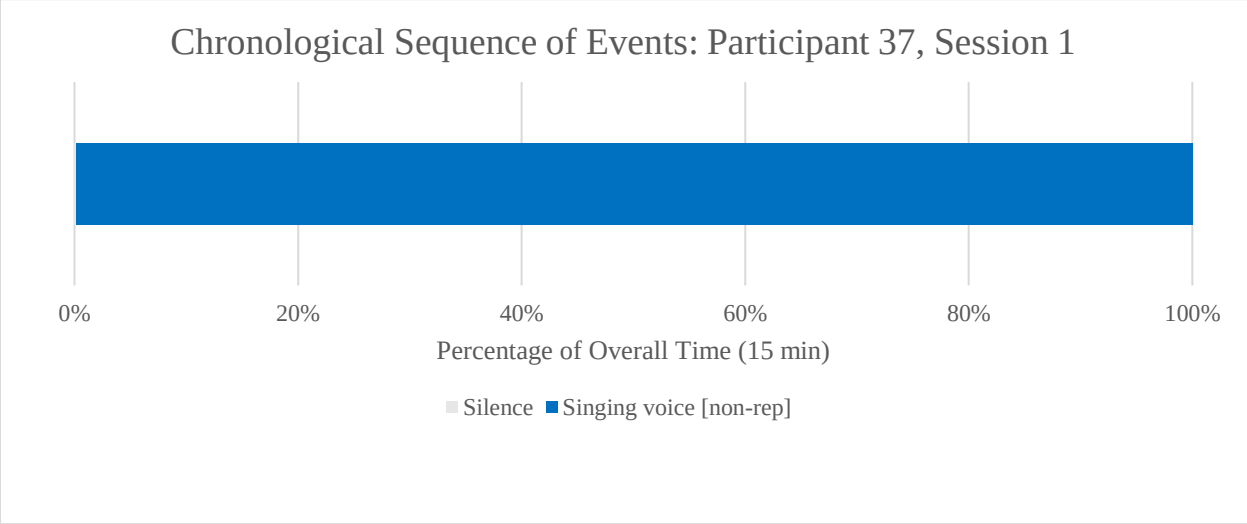

Figure L218. Chronological order of observed behavioral categories: Participant 37, Session 1.

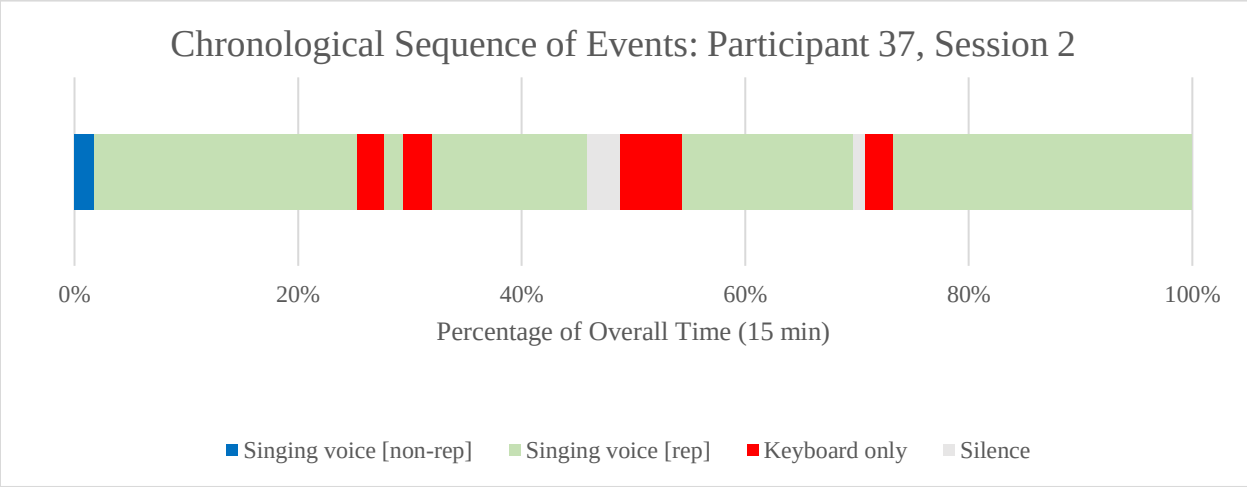

Figure L219. Chronological order of observed behavioral categories: Participant 37, Session 2.

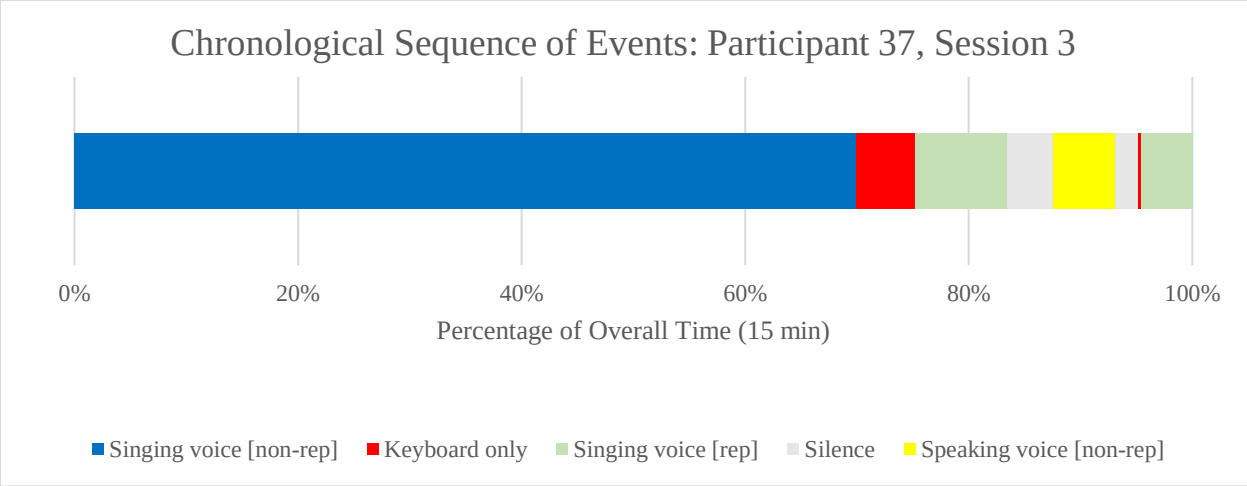

Figure L220. Chronological order of observed behavioral categories: Participant 37, Session 3.

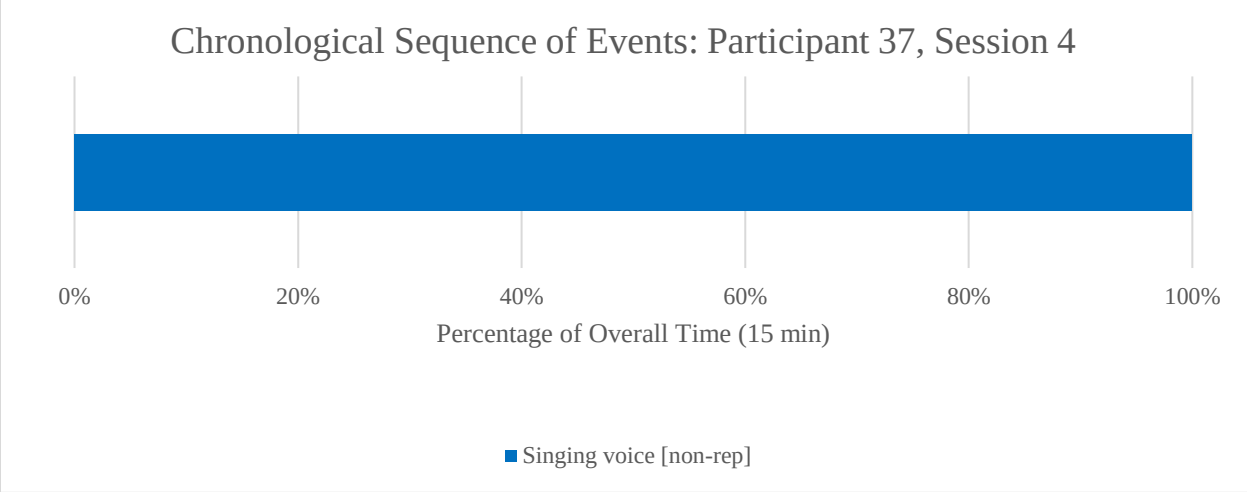

Figure L221. Chronological order of observed behavioral categories: Participant 37, Session 4.

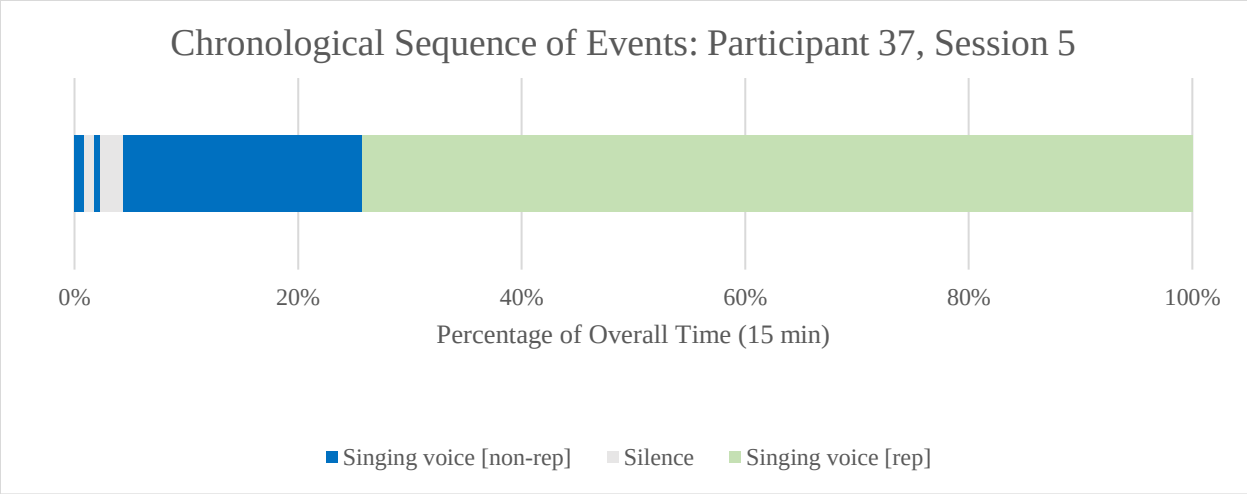

Figure L222. Chronological order of observed behavioral categories: Participant 37, Session 5.

Participant 38. Figure L223 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 38.

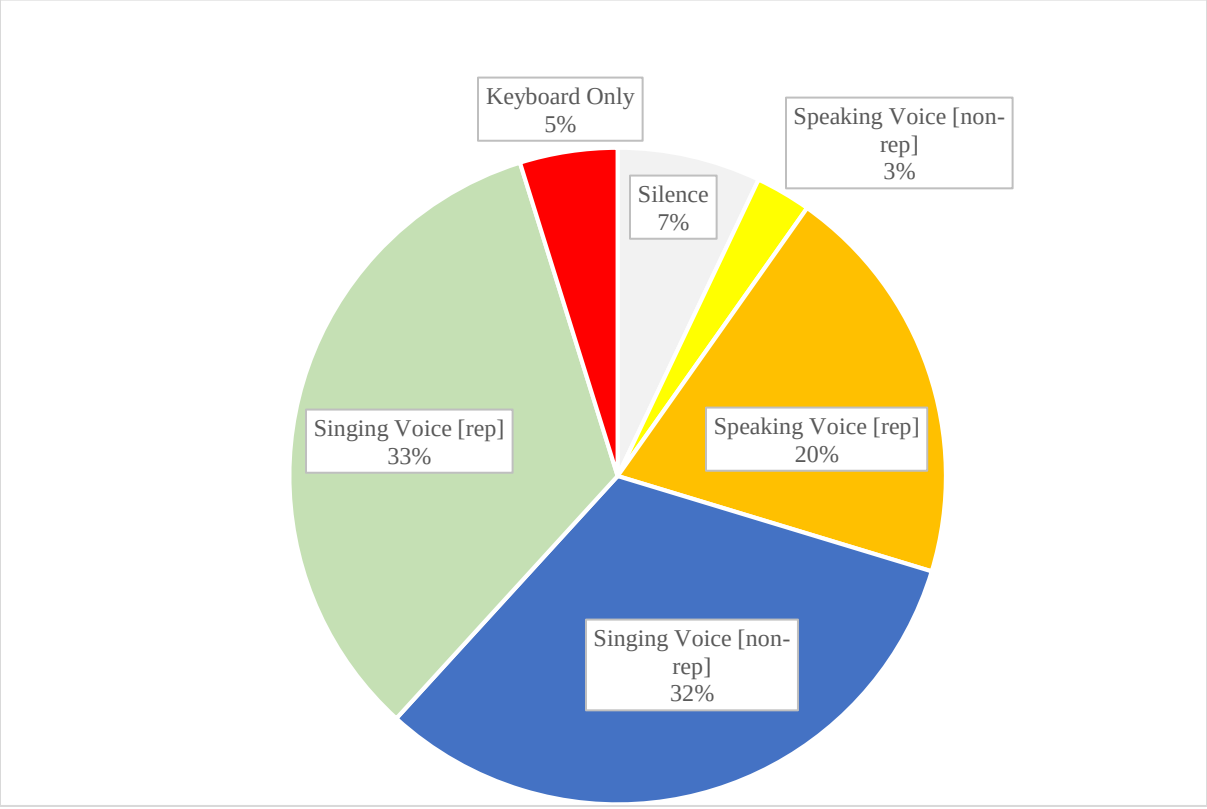

Figure L223. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 38.

Figures L224 – L228 present the chronological order of observed behavioral categories for each individual session by Participant 38.

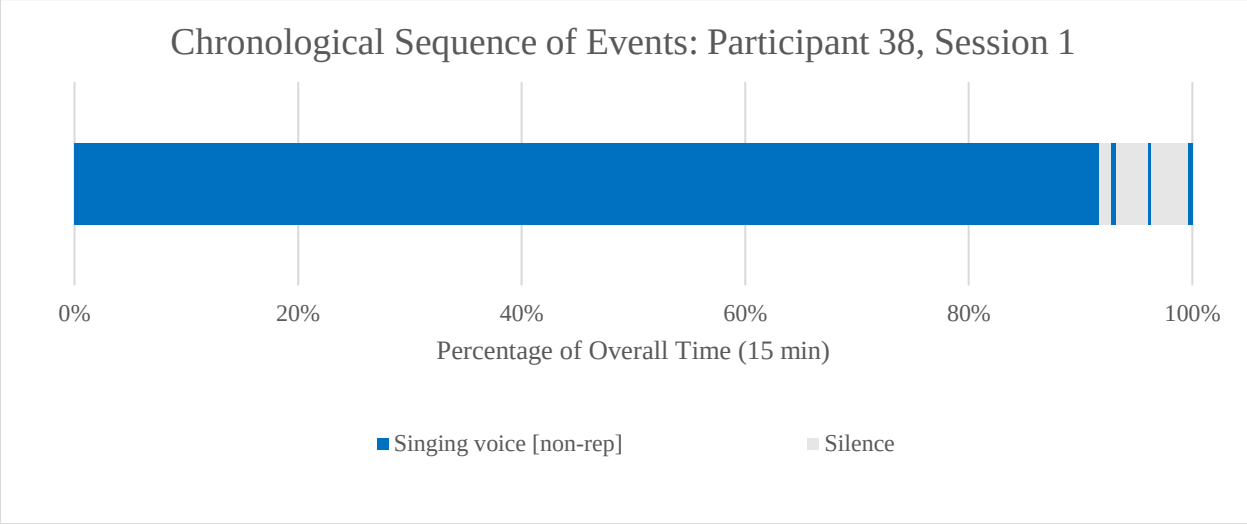

Figure L224. Chronological order of observed behavioral categories: Participant 38, Session 1.

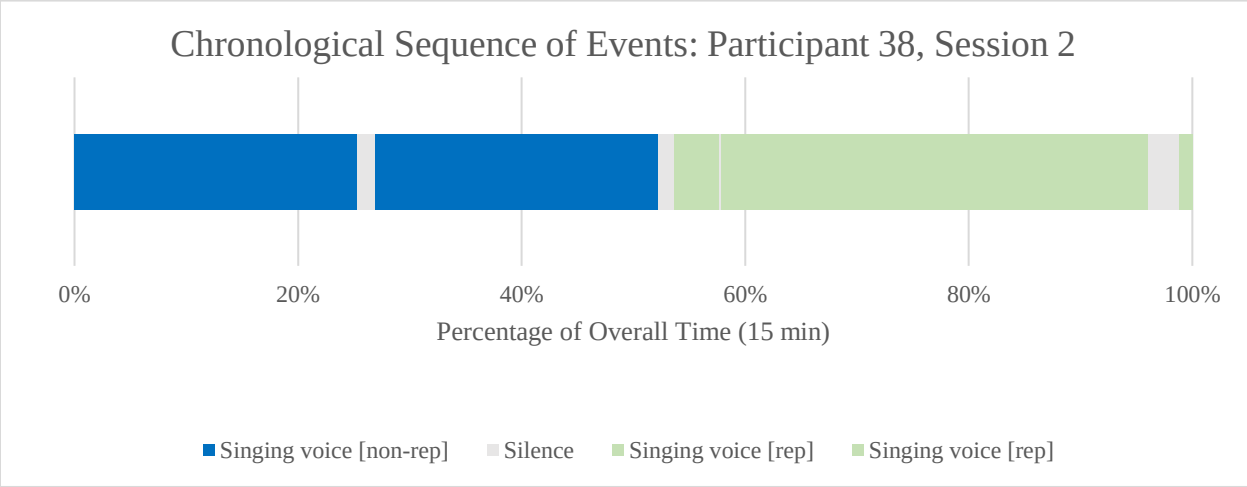

Figure L225. Chronological order of observed behavioral categories: Participant 38, Session 2.

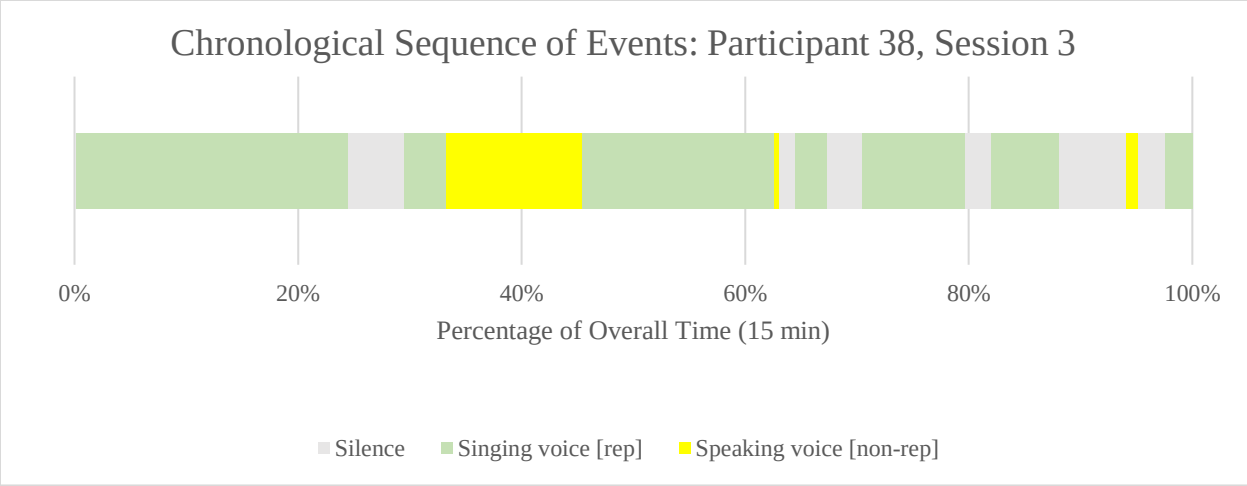

Figure L226. Chronological order of observed behavioral categories: Participant 38, Session 3.

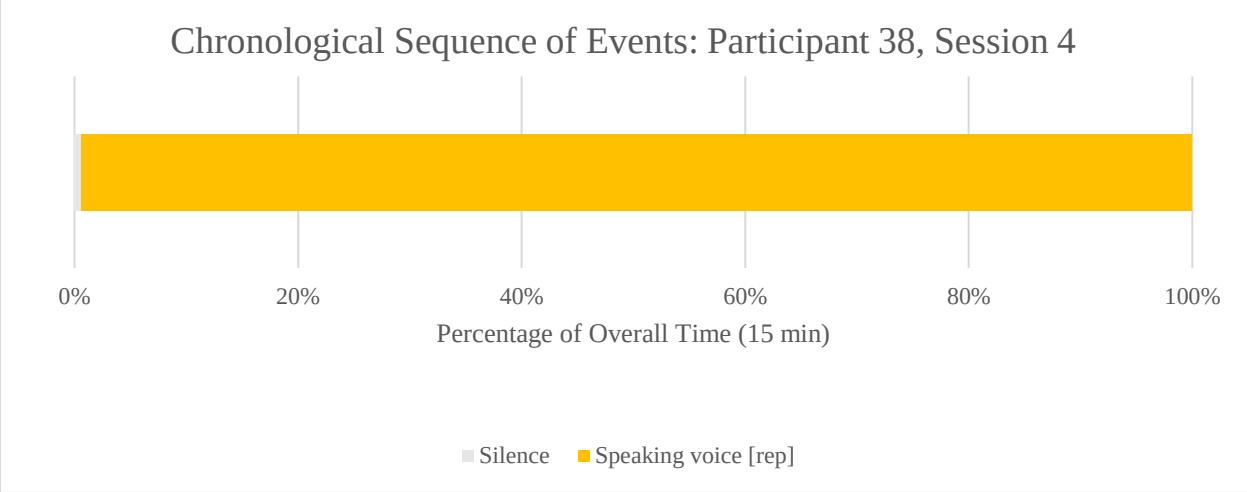

Figure L227. Chronological order of observed behavioral categories: Participant 38, Session 4.

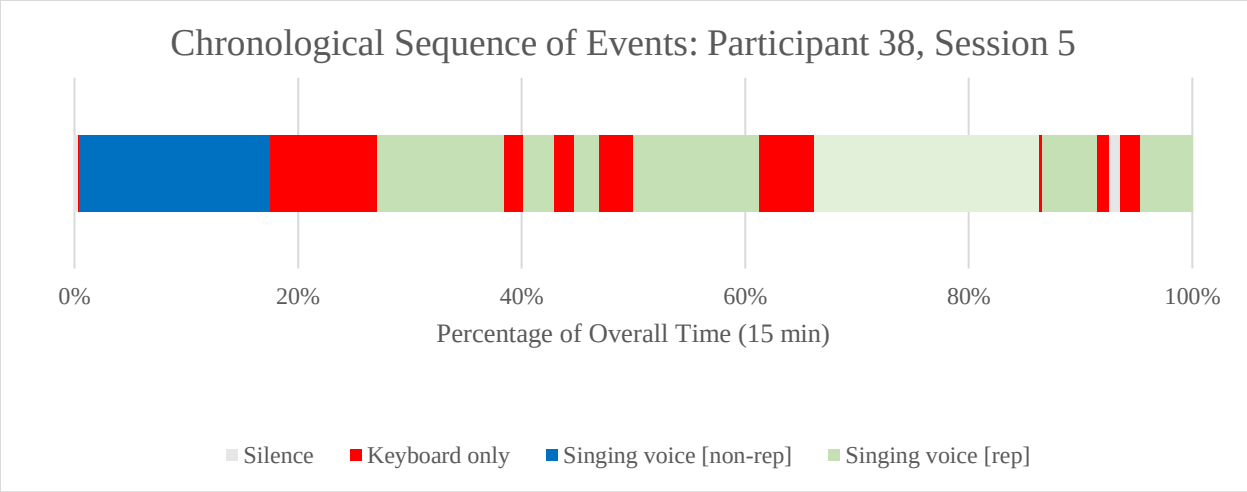

Figure L228. Chronological order of observed behavioral categories: Participant 38, Session 5.

Participant 39. Figure L229 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 39.

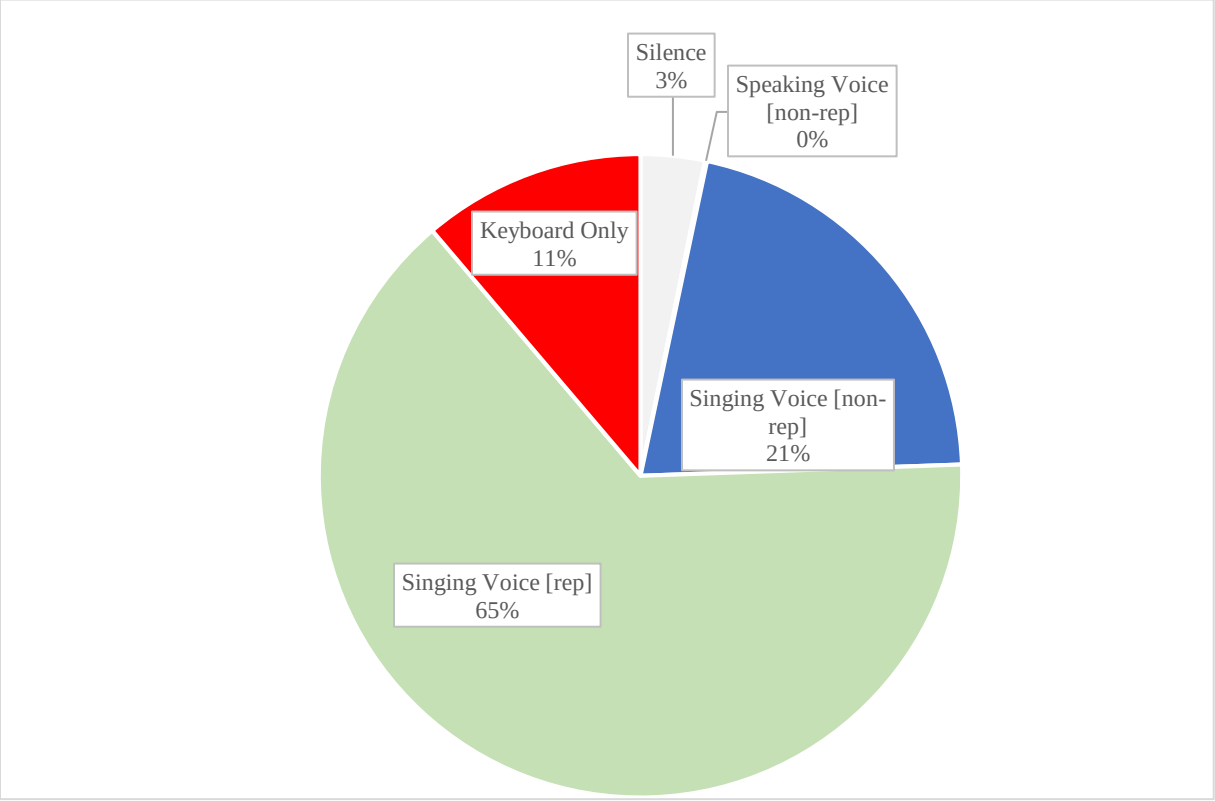

Figure L229. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 39.

Figures L230 – L234 present the chronological order of observed behavioral categories for each individual session by Participant 39.

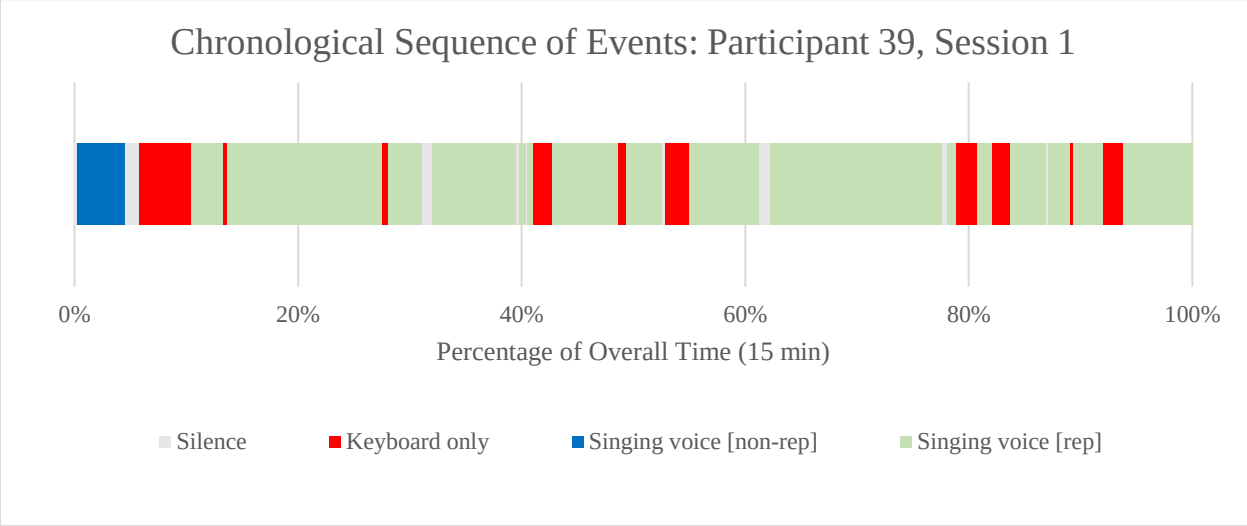

Figure L230. Chronological order of observed behavioral categories: Participant 39, Session 1.

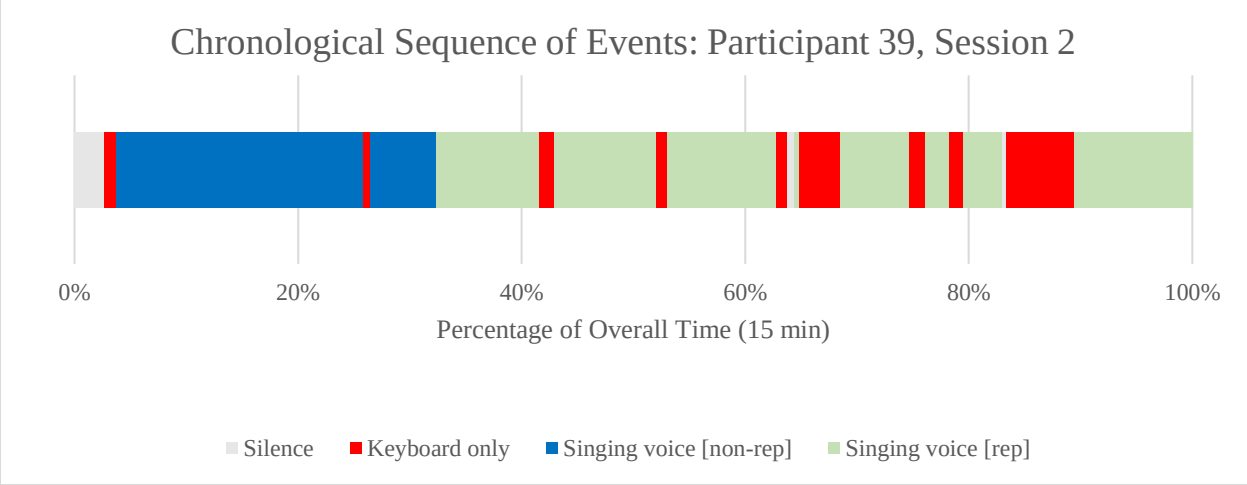

Figure L231. Chronological order of observed behavioral categories: Participant 39, Session 2.

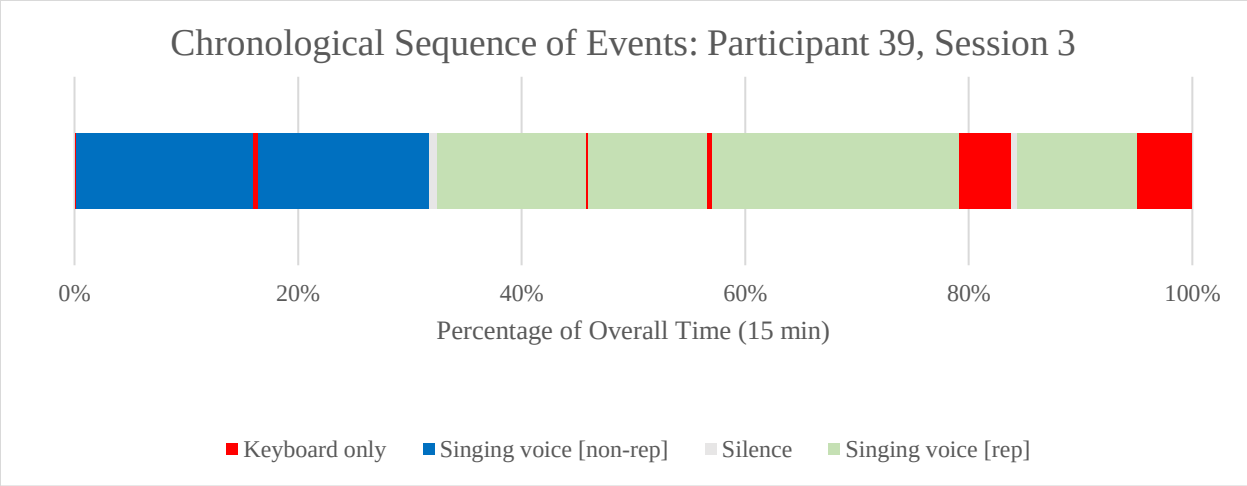

Figure L232. Chronological order of observed behavioral categories: Participant 39, Session 3.

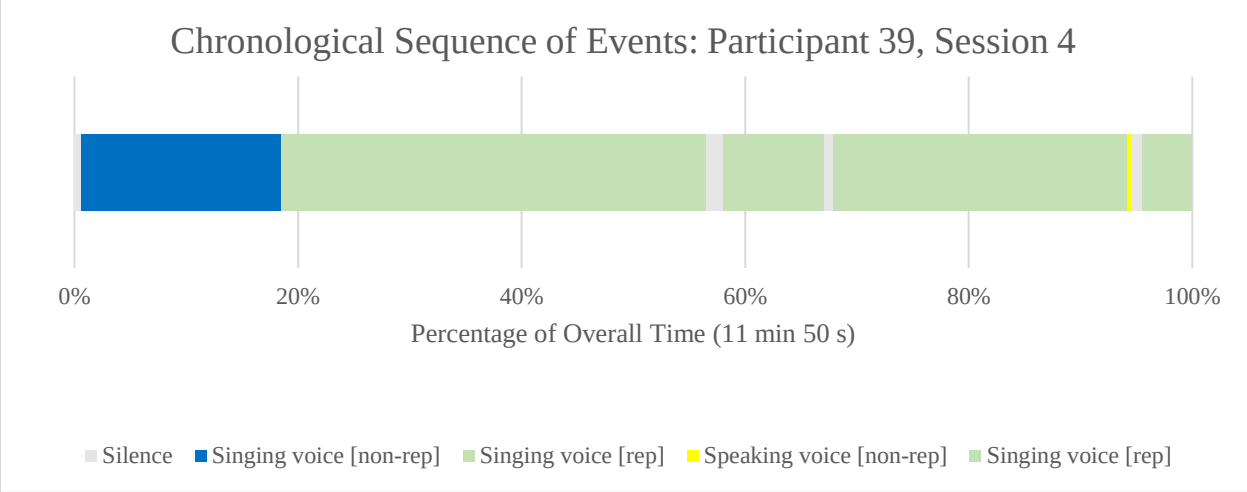

Figure L233. Chronological order of observed behavioral categories: Participant 39, Session 4.

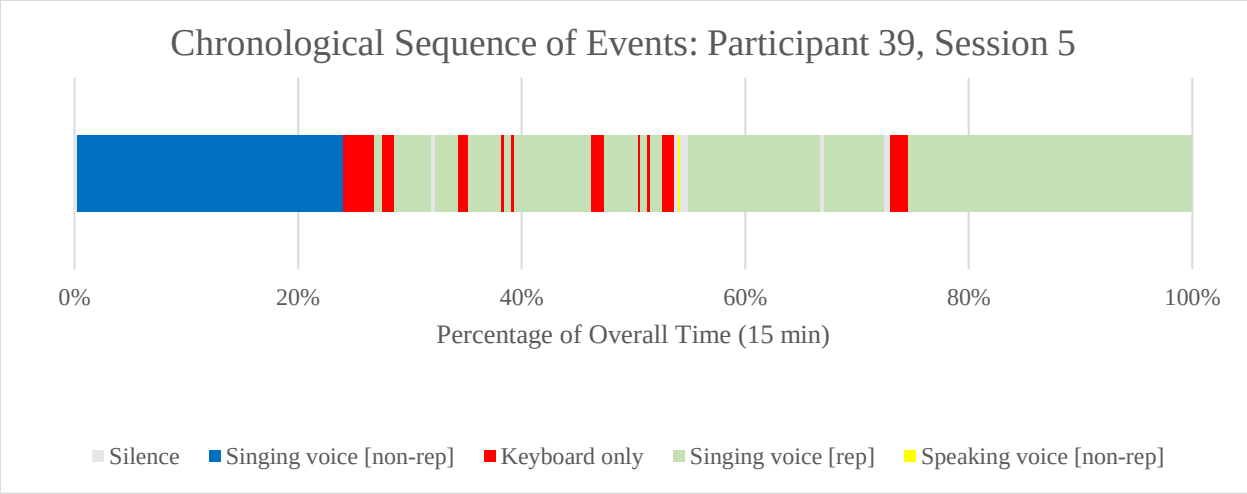

Figure L234. Chronological order of observed behavioral categories: Participant 39, Session 5.

Participant 40. Figure L235 displays the mean percentage of time spent in each behavioral category across all five sessions by Participant 40.

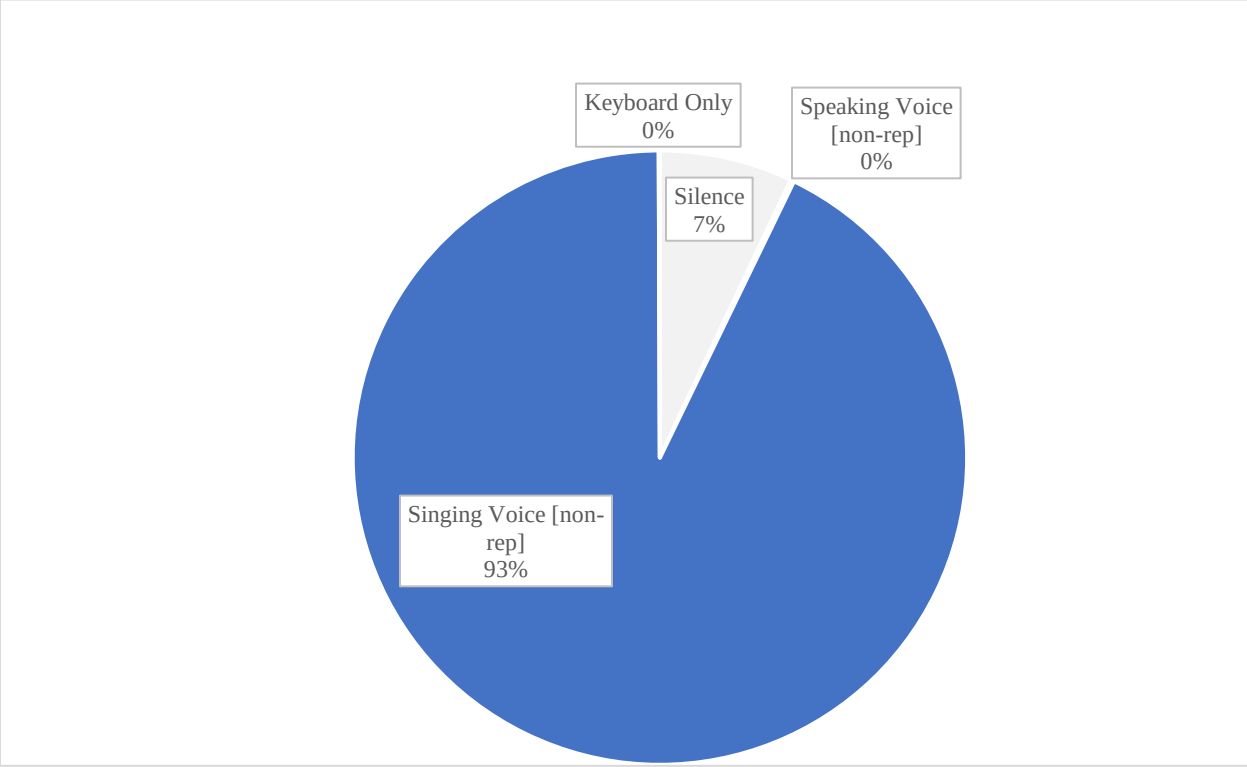

Figure L235. Aggregated mean percentages of time spent during the first 15 minutes across five practice sessions: Participant 40.

Figures L236 – L240 resent the chronological order of observed behavioral categories for each individual session by Participant 40.

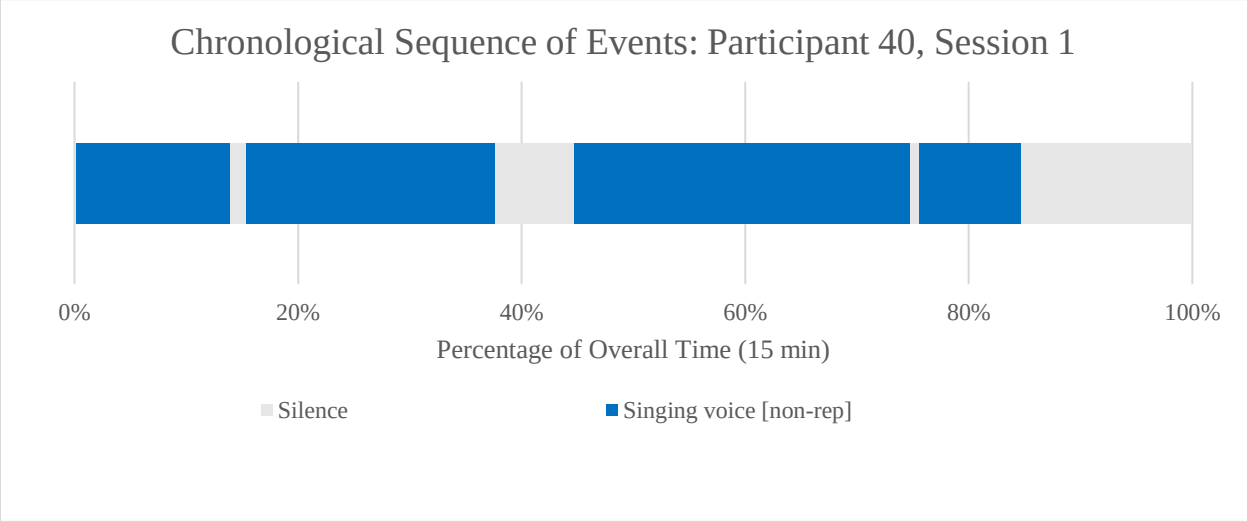

Figure L236. Chronological order of observed behavioral categories: Participant 40, Session 1.

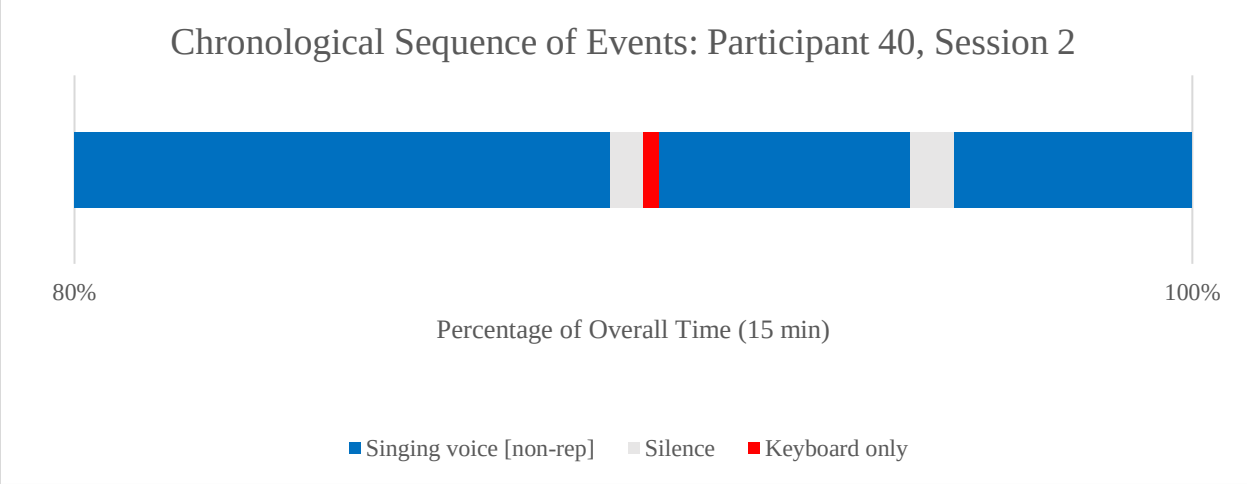

Figure L237. Chronological order of observed behavioral categories: Participant 40, Session 2.

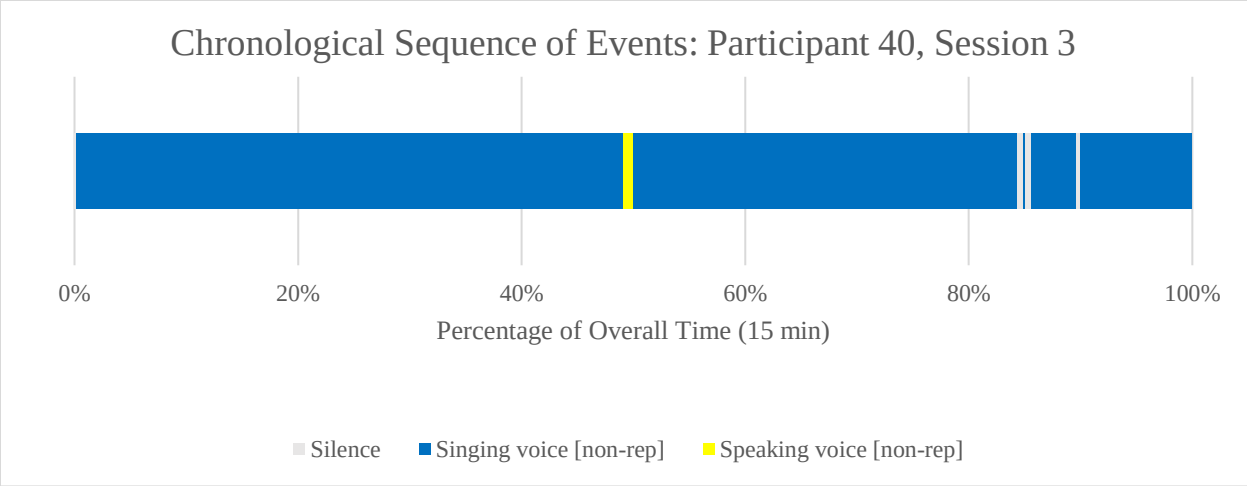

Figure L238. Chronological order of observed behavioral categories: Participant 40, Session 3.

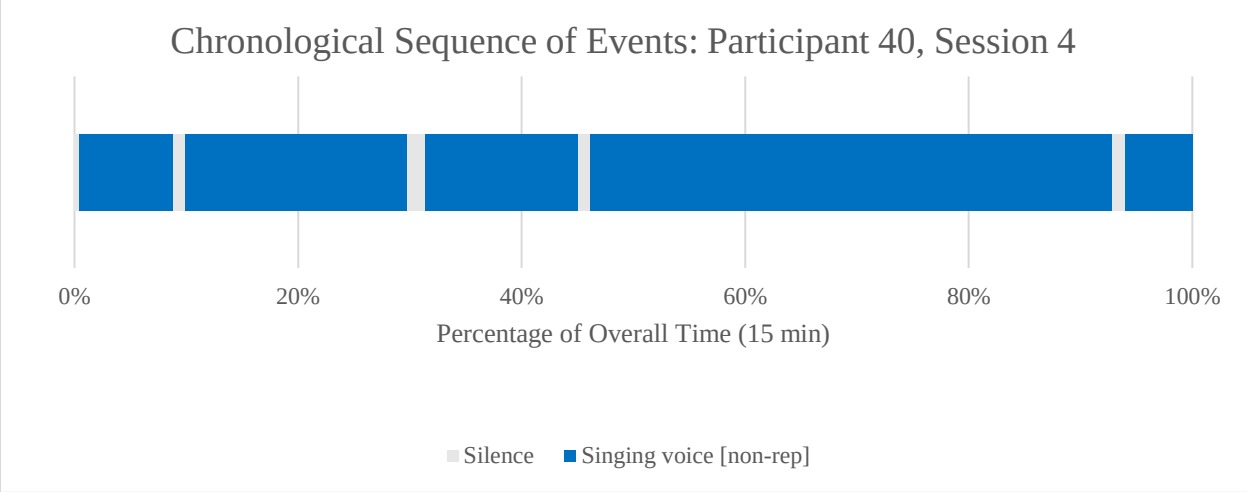

Figure L239. Chronological order of observed behavioral categories: Participant 40, Session 4.

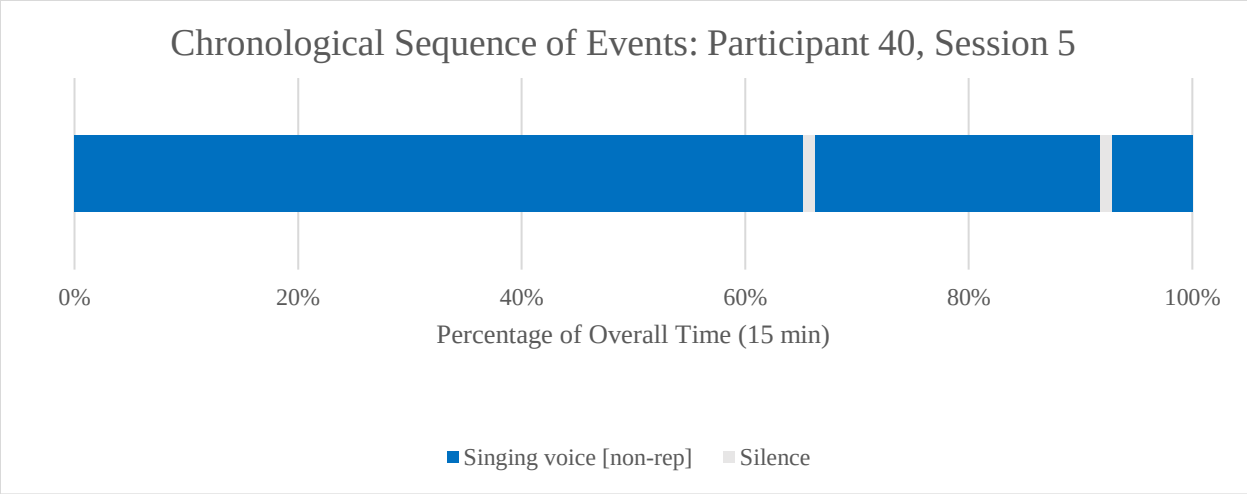

Figure L240. Chronological order of observed behavioral categories: Participant 40, Session 5.

Appendix M

RQ 5 Disaggregations: First Observed Practice Behaviors (Research Question Four).

Table M1 displays first audible behaviors, modal behavior, and self-reported first behavior data from female participants.

Table M1

Female Participants' (N = 22) First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
1	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
2	Keyboard Only	Singing Voice [rep]	Singing Voice [rep]	Keyboard Only	Keyboard Only	Keyboard Only	Vocal Warm-up Exercise
3	Singing Voice [non-rep]	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Vocal Warm-up Exercise
4	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
6	Singing Voice [non-rep]	Singing Voice [non-rep]	Speaking Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
8	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
9	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
10	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
12	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [rep]	Breath Activation Exercises	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
14	Singing Voice [non-rep]	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise

Table M1, continued

15	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
16	Singing Voice [non-rep]	Speaking Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
18	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
21	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Vocal Warm-up Exercise
25	Singing Voice [non-rep]	Singing Voice [rep]	Keyboard Only	Keyboard Only	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
26	Singing Voice [non-rep]	Singing Voice [non-rep]	Speaking Voice [rep]	Speaking Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
27	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
31	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
35	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
36	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
37	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
38	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Speaking Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercise

Note. P = Participant

Table M2 displays first audible behaviors, modal behavior, and self-reported first behavior data from male participants.

Table M2

Male Participants' (N = 18) First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
5	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
7	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
11	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
13	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Non-Vocal Warm-up Exercise
17	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
19	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
20	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
22	Singing Voice [rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
23	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
24	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [rep]	Vocal Warm-up Exercise
28	Keyboard Only	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Vocal Warm-up Exercise
29	Singing Voice [non-rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Speaking voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise

Table M2, continued

30	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
32	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Vocal Warm-up Exercise
33	Keyboard Only	Non-Keyboard Electronic Practice Aid [voicing]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Keyboard Only	Vocal Warm-up Exercise
34	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
39	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
40	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercises

Note. P = Participant

Table M3 displays first audible behaviors, modal behavior, and self-reported first behavior data from undergraduate student participants.

Table M3

Undergraduate Student Participants' (N = 22) First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
1	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
2	Keyboard Only	Singing Voice [rep]	Singing Voice [rep]	Keyboard Only	Keyboard Only	Keyboard Only	Vocal Warm-up Exercise
3	Singing Voice [non-rep]	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Vocal Warm-up Exercise
5	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
6	Singing Voice [non-rep]	Singing Voice [non-rep]	Speaking voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
7	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
8	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
12	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [rep]	Breath Activation Exercises	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
14	Singing Voice [non-rep]	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
15	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
18	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
19	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales

Table M3, continued

20	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
23	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
28	Keyboard Only	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Vocal Warm-up Exercise
30	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
31	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
33	Keyboard Only	Non-Keyboard Electronic Practice Aid [voicing]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Keyboard Only	Vocal Warm-up Exercise
34	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
36	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
39	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
40	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercise

Note. P = Participant

Table M4 displays first audible behaviors, modal behavior, and self-reported first behavior data from graduate student participants.

Table M4

Graduate Student Participants' (N = 18) First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
4	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
9	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
10	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
11	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
13	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Non-Vocal Warm-up Exercise
16	Singing Voice [non-rep]	Speaking voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
17	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
21	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Vocal Warm-up Exercise
22	Singing Voice [rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
24	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [rep]	Vocal Warm-up Exercise
25	Singing Voice [non-rep]	Singing Voice [rep]	Keyboard Only	Keyboard Only	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
26	Singing Voice [non-rep]	Singing Voice [non-rep]	Speaking voice [rep]	Speaking voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise

Table M4, continued

27	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
29	Singing Voice [non-rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Speaking voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
32	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Vocal Warm-up Exercise
35	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
37	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
38	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Speaking voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercises

Note. P = Participant

Table M5 displays first audible behaviors, modal behavior, and self-reported first behavior data from vocal performance majors.

Table M5

Vocal Performance Majors' (N = 29) First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
1	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
2	Keyboard Only	Singing Voice [rep]	Singing Voice [rep]	Keyboard Only	Keyboard Only	Keyboard Only	Vocal Warm-up Exercise
4	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
7	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
9	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
10	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
11	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
12	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [rep]	Breath Activation Exercises	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
13	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Non-Vocal Warm-up Exercise
15	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
16	Singing Voice [non-rep]	Speaking voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
17	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise

Table M5, continued

18	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
19	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
21	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Vocal Warm-up Exercise
22	Singing Voice [rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
24	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [rep]	Vocal Warm-up Exercise
25	Singing Voice [non-rep]	Singing Voice [rep]	Keyboard Only	Keyboard Only	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
26	Singing Voice [non-rep]	Singing Voice [non-rep]	Speaking voice [rep]	Speaking voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
27	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
28	Keyboard Only	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Vocal Warm-up Exercise
29	Singing Voice [non-rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Speaking voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
31	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
32	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Vocal Warm-up Exercise
34	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
35	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
37	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
38	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Speaking voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise

Table M5, continued

40	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercise

Note. P = Participant

Table M6 displays first audible behaviors, modal behavior, and self-reported first behavior data from non-performance major participants.

Table M6

Non-Performance Majors' (N = 11) First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
3	Singing Voice [non-rep]	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Vocal Warm-up Exercise
5	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
6	Singing Voice [non-rep]	Singing Voice [non-rep]	Speaking voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
8	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
14	Singing Voice [non-rep]	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
20	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
23	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
30	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
33	Keyboard Only	Non-Keyboard Electronic Practice Aid [voicing]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Keyboard Only	Vocal Warm-up Exercise
36	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
39	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercises

Note. P = Participant

Table M7 displays first audible behaviors, modal behavior, and self-reported first behavior data from participants reporting less than one year of voice lessons.

Table M7

First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior of Participants Reporting <1 Year of Voice Lessons (N = 3)

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
20	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
23	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
36	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercise

Note. P = Participant

Table M8 displays first audible behaviors, modal behavior, and self-reported first behavior data from participants reporting 1-2 years of voice lessons.

Table M8

First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior of Participants Reporting 1-2 Years of Voice Lessons (N = 6)

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
22	Singing Voice [rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
28	Keyboard Only	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Vocal Warm-up Exercise
30	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
33	Keyboard Only	Non-Keyboard Electronic Practice Aid [voicing]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Keyboard Only	Vocal Warm-up Exercise
34	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
39	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercise

Note. P = Participant

Table M9 displays first audible behaviors, modal behavior, and self-reported first behavior data from participants reporting 3-5 years of voice lessons.

Table M9

First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior of Participants Reporting 3-5 Years of Voice Lessons (N = 7)

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
3	Singing Voice [non-rep]	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Vocal Warm-up Exercise
7	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
8	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
14	Singing Voice [non-rep]	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
25	Singing Voice [non-rep]	Singing Voice [rep]	Keyboard Only	Keyboard Only	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
26	Singing Voice [non-rep]	Singing Voice [non-rep]	Speaking voice [rep]	Speaking voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
40	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercise

Note. P = Participant

Table M10 displays first audible behaviors, modal behavior, and self-reported first behavior data from participants reporting 6-9 years of voice lessons.

Table M10

First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior of Participants Reporting 6-9 Years of Voice Lessons (N = 11)

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
2	Keyboard Only	Singing Voice [rep]	Singing Voice [rep]	Keyboard Only	Keyboard Only	Keyboard Only	Vocal Warm-up Exercise
5	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
10	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
11	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
12	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [rep]	Breath Activation Exercises	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
16	Singing Voice [non-rep]	Speaking voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
17	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
19	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
29	Singing Voice [non-rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Speaking voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
31	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
37	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercise

Note. P = Participant

Table M11 displays first audible behaviors, modal behavior, and self-reported first behavior data from participants reporting 10 or more years of voice lessons.

Table M11

First Audible Behaviors, Modal Behavior, and Self-Reported First Behavior of Participants Reporting 10+ Years of Voice Lessons (N = 13)

P	Session 1	Session 2	Session 3	Session 4	Session 5	Mode	Reported First Behavior
1	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Non-Vocal Warm-up Exercise
4	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
6	Singing Voice [non-rep]	Singing Voice [non-rep]	Speaking voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
9	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
13	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Non-Vocal Warm-up Exercise
15	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
18	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
21	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Vocal Warm-up Exercise
24	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [rep]	Vocal Warm-up Exercise
27	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Technical Exercises or Scales
32	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Keyboard Only	Singing Voice [non-rep]	Vocal Warm-up Exercise
35	Singing Voice [non-rep]	Breath Activation Exercises	Singing Voice [rep]	Singing Voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise

Table M11, continued

38	Singing Voice [non-rep]	Singing Voice [non-rep]	Singing Voice [rep]	Speaking voice [rep]	Singing Voice [non-rep]	Singing Voice [non-rep]	Vocal Warm-up Exercise
Mode						Singing Voice [non-rep]	Vocal Warm-up Exercises

Note. P = Participant